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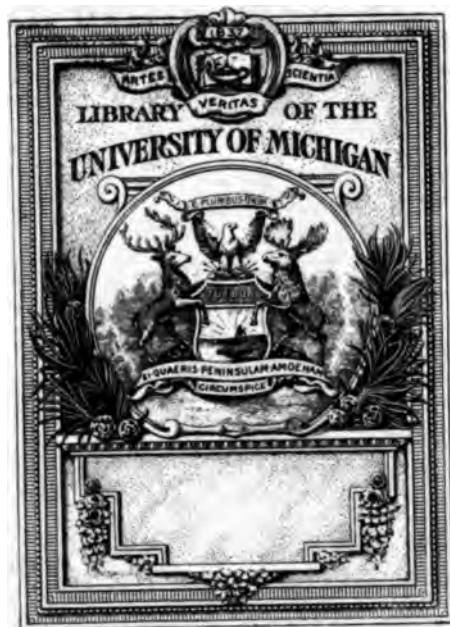
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ANNUAL REPORTS

OF THE

WAR DEPARTMENT

FOR THE

FISCAL YEAR ENDED JUNE 30, 1904.

VOLUME II.

ARMAMENT, TRANSPORTATION, AND SUPPLY.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1904.

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ARRANGEMENT OF THE ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE YEAR ENDED JUNE 30, 1904.

- Volume I.....**Secretary of War:
Chief of Staff.
The Military Secretary.
Inspector-General.
Judge-Advocate-General.
- Volume II.....****Armament, Transportation and Supply:**
Quartermaster-General.
Commissary-General.
Surgeon-General.
Paymaster-General.
Chief of Engineers, Military Affairs.
Chief of Ordnance.
Chief Signal Officer.
Chief of Artillery.
Board of Ordnance and Fortification.
- Volume III.....****Division and Department Commanders:**
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1. Department of the East.
2. Department of the Gulf.
Northern Division—
1. Department of the Lakes.
2. Department of the Missouri.
3. Department of Dakota.
Southwestern Division—
1. Department of Texas.
2. Department of the Colorado.
Pacific Division—
1. Department of California.
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Philippines Division—
1. Department of Luzon.
2. Department of the Visayas.
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- Volume IV.....****Military Schools and Colleges; Militia Affairs, Military Parks, and Soldiers' Homes.**
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1. Board of Visitors.
2. Superintendent.
School of Application for Cavalry and Field Artillery.
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School of Submarine Defense.
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1. Chickamauga and Chattanooga.
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Inspection of National Home for Disabled Volunteer Soldiers.
- Volumes V-IX.....**Chief of Engineers.
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REPORT OF THE QUARTERMASTER-GENERAL.

WAR DEPARTMENT,
OFFICE OF THE QUARTERMASTER-GENERAL,
Washington, November 10, 1904.

SIR: The annual report of the Quartermaster-General for the year ended June 30, 1904, hereby rendered, must necessarily constitute but a brief summary of the innumerable important matters demanding and receiving the Department's attention during the year, together with a few recommendations for future departmental and legislative action along lines which, in the Quartermaster-General's opinion, will advance the Government's best interests.

Like the several immediately preceding it, the past fiscal year was an exceedingly busy one. The fact that another year has elapsed since actual war, has in no way diminished the apparently ever-increasing demands upon this great construction and supply department. The enormous amount of work involved in rebuilding or enlarging old posts and establishing new ones, in order to adequately provide barracks, quarters, hospitals, storehouse facilities, and miscellaneous buildings to meet the needs of the increased strength of the Army, can hardly be comprehended by anyone not in close touch with the service. This work, which would tax the best ability and energies of a force numerically strong enough to permit of giving it proper official attention at all points, has been made doubly onerous because of the inadequate number of quartermasters now provided by law, and the greatly depleted civilian force in the Quartermaster-General's Office, upon which there necessarily devolves labor incidental to originating plans and drafting specifications, passing upon those originated in the Department at large, directing awards of contracts, and deciding the numberless points and controversies which naturally attend all large undertakings.

So important is the matter of the efficient and expeditious transaction of business in this office, and so embarrassed has the office been of late because of a constantly decreasing force, long since reduced in numbers below what is absolutely necessary to actually prevent the great volume of work from falling in arrears, that here, almost at the opening of the report, the Quartermaster-General strongly recommends some increase in his clerical force, and earnestly urges early favorable consideration of the recommendation in the interest of the proper and efficient administration of his office.

The duties which by law and regulations are imposed upon the Quartermaster's Department have been often set forth in detail in annual reports and need not be reiterated here. Briefly, they begin with supplying the recruit with his first army clothing and extend to providing and caring for the soldier's last resting place, and between these two extremes there is included all that is necessary to properly clothe, equip, shelter, and transport, by land and water, the entire Army, its supplies of every class and kind—all of its constituent parts. Perhaps no better idea can be gained of the magnitude of this Department's work than by simply considering that it had at disposal during the fiscal year appropriations aggregating \$53,593,501.70. The chief uses for which these were expended will be touched upon with some detail hereinafter.

FINANCIAL STATEMENT.

By acts of Congress approved March 2 and 3, 1903, there was appropriated for the regular service of the Quartermaster's Department for the fiscal year ended June 30, 1904, the sum of.....	\$31,928,817.50
During the fiscal year there was deposited to the credit of appropriations 1904 amounts received from sales to officers, etc.....	2,166,750.34
During the fiscal year there was deposited to the credit of appropriations 1904 by Treasury transfer warrant.....	500,000.00
Making a total of.....	34,595,567.84
Of this there was remitted to disbursing officers....	\$28,768,489.21
There was paid out on account of settlements made at Treasury of claims and accounts	34,610.22
	28,803,099.43
Leaving a balance on July 1, 1904, available for payment of outstanding obligations incurred or fulfillment of contracts properly entered into within the fiscal year of.....	5,792,468.41
On July 1, 1903, there was on hand from the regular appropriations for the service of the Quartermaster's Department pertaining to the fiscal year ended June 30, 1903.....	14,845,685.88
And from appropriations barracks and quarters, 1903 and 1904; and equipment of officers' schools, military posts, 1903 and 1904.....	1,998,066.00
And from appropriations pertaining to previous fiscal years the sum of	25,321,679.12
And from appropriations for special and indefinite purposes, certified claims, etc	5,070,546.61
Making a total balance on hand of these appropriations of....	47,235,977.61
For specific purposes there was appropriated during the fiscal year ended June 30, 1904.....	\$1,250,012.46
During the year there was deposited and transferred to credit of appropriations other than those of 1904, as shown above, including the sum of \$347,781.38 for Pacific Railroads for years 1901 and prior years, 1902, 1903, and 1904, and also the sum of \$74,939.46 for barracks and quarters 1903 and 1904, and \$71.62 for equipment of officers' schools, military posts 1903 and 1904	5,107,511.63
	6,357,524.09
Making a total on hand from these appropriations of	53,593,501.70
Of said amounts there was remitted to disbursing officers the sum of.....	\$10,797,358.55
There was paid out on account of Treasury settlements	1,711,273.98
There was charged against appropriations by Treasury transfer warrants	509,912.00

REPORT OF THE QUARTERMASTER-GENERAL.

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There was carried to the surplus fund.....	\$25,097,462.97	
		<u>\$38,116,007.50</u>
Leaving a balance on hand July 1, 1904.....		<u>15,477,494.20</u>

RECAPITULATION.

Remitted to officers and paid out on Treasury settlements from appropriations for the regular service of the Quartermaster's Department for the fiscal year ended June 30, 1904.....	\$28,803,099.43	
From appropriations previous fiscal years and from indefinite and special appropriations, and charged against said appropriations by Treasury transfer warrants.....		<u>13,018,544.53</u>
Total.....		<u>41,821,643.96</u>
Balance remaining in Treasury July 1, 1904, of appropriations for the regular service of the Quartermaster's Department for the fiscal year ended June 30, 1904.....	5,792,468.41	
And of appropriations for previous fiscal years, and for indefinite and special appropriations.....		<u>15,477,494.20</u>
Total.....		<u>21,269,962.61</u>

By act of April 27, 1904, there was made immediately available \$16,500, "Shooting galleries and ranges, 1904 and 1905." No remittances were made on account of this appropriation prior to June 30, 1904, and on that date there still remained a balance in the Treasury of \$16,500.

CLOTHING AND EQUIPAGE.

The amount appropriated by Congress for clothing and equipage for the fiscal year was \$4,750,000, to which were credited as reimbursements on account of issues of clothing, etc., "to the militia of the States and Territories and the District of Columbia," \$638,766.79, and on account of collections by the Pay Department for clothing drawn by enlisted men in excess of their allowance; of sales to officers, to the militia, and other miscellaneous authorized sales \$287,880.64, making a total of \$5,676,667.43. Of this sum there were remitted to officers of the Department for the purchase and manufacture of clothing and equipage \$4,158,330.73, and for the payment of claims by the Treasury \$477.96, making a total of \$4,158,808.69, leaving a balance of \$1,517,858.74 in the Treasury on June 30, 1904, the greater part of which will be used to pay outstanding indebtedness incurred prior to the close of the fiscal year.

QUALITY OF CLOTHING AND EQUIPAGE.

The strictest supervision has been exercised over the character of the clothing and equipage purchased and manufactured, with a view to maintaining standard and specification requirements in all cases. The inspections have been most thorough and it is believed the object sought has been accomplished.

From the annual report of the chief quartermaster, Philippines Division, it appears that clothing received there was generally sufficient and of good quality. While exception is made as to some articles of uniform, it should be borne in mind that they were purchased dur-

ing the Spanish war and the time of hostilities in the Philippines, when the exigencies of the service were such that it was impossible to secure supplies strictly conforming to standards and specifications. The demands made upon the department during this period were enormous, but were successfully met. The sudden large reduction in the military forces left in the depots a great stock of clothing supplies, procured under stress of emergency, which economy requires should be absorbed by issues. Officers should cooperate with the department in making use of this clothing to the fullest extent, especially the khaki clothing, which was procured for use of troops serving in the Tropics. The demand for this class of clothing was large, and the American product first used in its manufacture was the best that could be procured, unless recourse was had to drilling of foreign production. The color was not so fast as in the foreign material, but the dye in the American goods has since been greatly improved, and extensive tests show it to be now fast and satisfactory.

In making issues of clothing to the Army and to the militia, this office has never lost sight of the large supply of valuable and excellent clothing on hand rendered obsolete by the adoption of the new uniform. Notwithstanding a general inclination to avoid drawing the same, this office has insisted upon a compliance with the provisions of General Orders No. 132, Adjutant-General's Office, 1902, which requires that the issue of the various articles in which changes have been made shall not commence until the present available supply of corresponding articles shall have been exhausted.

As indicated in my last annual report, some of the organizations returning from a tour of duty in the Philippines were supplied with the new uniform. All other organizations were required to adhere to the former regulation clothing.

As an inducement to the Army and to aid the Department in disposing of the uniforms of the former pattern, the Quartermaster-General, on the 15th of June last, submitted to the Assistant Secretary of War his views upon the subject, as follows:

The question of disposing of the clothing referred to, without great loss to the Government, is a most serious one. This Department has endeavored in every way to compel its issue to both the regulars and the militia, and it is important that this should be done before the issue of the new uniform. It is believed that many soldiers are refraining from drawing necessary clothing of the old pattern, expecting that the new uniform will be issued very soon.

After consideration by the Assistant Secretary of War, this office was called upon to submit a plan for the absorption of the old-style clothing, and on the 24th of June last submitted a tentative plan which resulted in the preparation by this office and the promulgation by the War Department on July 13 last of General Orders, No. 122, current series, which requires:

1. That all the troops serving in the United States, with the exception of the Artillery Corps, be equipped with the full-dress uniform, consisting of dark-blue caps with bands; dress coat, new pattern; collar ornaments; breast cord, and, until exhausted, with trousers of the pattern in use prior to the adoption of the new uniform.

2. That all artillery troops serving in the United States be equipped with the full-dress uniform, consisting of dark-blue caps with bands, uniform dress coat and trousers of the pattern in use prior to the adoption of the new uniform, collar ornaments, and breast cord. The issue of the coats and trousers to continue until available stock shall have become exhausted by issues.

3. That all organizations heretofore provided with the entire new uniform be so equipped hereafter.

4. That organizations which have been furnished with the olive-drab service uniform only continue to draw the same. All other troops will, until they can be so supplied, continue to draw the articles issued prior to the adoption of the new uniform.

5. That the issue of the sky-blue overcoats on hand be continued to all organizations which have not already been provided with the new olive-drab overcoat.

6. That no olive-drab flannel shirts be supplied to any organization until the dark-blue flannel shirts on hand shall have been absorbed.

7. That khaki cork helmets be worn with the khaki cotton uniform by troops serving in the United States until exhausted, except on occasions when the requirements of the service will necessitate the wearing of the campaign hat.

8. That all troops be permitted to draw dark-blue blouses, manufactured prior to the adoption of the new uniform, for wear when not on duty, if they so desire.

9. That the issue of service trousers made of cotton khaki material be continued until exhausted, except to organizations which have already been provided with breeches.

As an inducement to the men to draw the old-style clothing, the issue price has been reduced.

CAMPAIGN HATS.

Owing to the gradual deterioration of the quality of campaign hats heretofore procured under contracts, this office has carefully gone into and studied the subject of improving that article.

Several manufacturers were consulted and experimental samples procured from which a hat composed of a higher grade of materials has been selected and which, while more expensive, will no doubt be more durable and give greater satisfaction. Standards and specifications have been adopted and a contract for the supply of 100,000 entered into, so that after those now on hand shall have been absorbed by issues the Department will be prepared to fully supply the Army and Militia with a hat regarding which there should be no future complaints.

OLIVE DRAB AND COTTON KHAKE SERVICE COATS.

Steps have been taken to provide all the olive drab and cotton khaki service coats hereafter to be manufactured with choked bellows pockets instead of the former style of patch pockets, as they are considered much more convenient and useful.

CHEVRONS.

Under existing regulations each of the various kinds of coats requires a different kind of chevron, the bars of which are of the high-colored facing cloths conforming to the various arms of the service. The colors used in dyeing this cloth are very fugitive.

Experiments to obtain a chevron that would stand washing when attached to the white summer and cotton khaki coats were made; samples were procured from the very best dyers of this country and abroad, but nothing suitable obtained, so that finally the color of the olive-drab shirting flannel was decided upon as the best.

Bars made of cloth of this shade, sewed upon a groundwork of olive-drab serge, will harmonize with the service coats, and at the same time are sufficiently distinctive. Bars of the same cloth sewed upon a groundwork of either cotton khaki or white duck will harmonize with the khaki service and white summer coats.

While the distinctive colors of the various arms of the service have been disregarded in these chevrons, it will not lead to confusion, because the hat cords show color of the arm of service and the ornaments upon the coat collars the organization to which an enlisted man belongs.

The Secretary of War has approved this change, and as soon as published in General Orders the manufacture and issue of the new chevrons will commence.

SHOES.

Much progress toward improving the quality of the footwear of the enlisted men of the Army has been made, and it is hoped that one of the most difficult problems connected with the equipment of the soldiers has been solved.

First consideration was given to improving the widths and sizes. After securing numerous samples of shoes from which to select those considered most suitable, it was determined to have them made in conformity with commercial measurements and to make purchases accordingly. Sizes and widths of shoes required by 7,000 enlisted men were ascertained, which enabled this Department to establish an approximate tariff.

Shoes will hereafter be purchased of commercial widths C, D, E, EE, and F, corresponding to the old army widths AA, A, B, and C. The commercial "C" is a narrower width than any heretofore supplied, and will meet a long felt want. The lengths will range from sizes 5 to 12, inclusive, as heretofore.

Of the samples selected those deemed most suitable are—

1. For field service, a russet-tanned marching shoe, blucher style, of grain calf leather thoroughly stuffed, having a bellows tongue and toe caps and box toes. Height of shoe for a No. 8, 8 inches.

2. For dress occasions, a black calfskin shoe, blucher style, vamps of best black chrome-tanned calfskin of uniform thickness. Quarters and tops to be best quality kangaroo calf. These shoes also have bellows tongues, toe caps, and box toes. Height, 5½ inches for a No. 8 shoe.

3. For ordinary wear, a russet garrison shoe, blucher style, with bellows tongue, toe cap, and box toes, same as the black shoe, except that the uppers are to be of best chrome-tanned russet calfskins.

These sample shoes were submitted to the Secretary of War, who approved of their adoption as the future standards for the Army, and specifications and standard samples have been perfected and distributed to the purchasing depots.

A contract for 75,000 pairs each of russet marching and black calfskin shoes has been made, and it is the intention to have them ready for issue as soon as the present available stock shall have been materially reduced.

IRON BEDSTEAD.

For a number of years the Department has been purchasing iron bedsteads, with woven-wire bottoms, for use of enlisted men in barracks. In course of time, through purchase from different contractors supplying varying patterns, the difficulty, delay, and expense of repairing or renewing the bottoms became excessive because of these differences, in some cases the cost of replacing bottoms being as much as the first cost of the bedstead.

To avoid this and eliminate features in the bottom found objectionable for army uses, a new standard iron bedstead was adopted, after much time and care spent in its perfection, and for use with it a wire-fabric

mattress which has many advantages over the old woven-wire mattress. The new mattress is made of many links of steel wire, heavily galvanized, and is fastened to the frame by a large number of steel springs at each end.

The entire fabric may be very easily removed from the frame and rolled up into such small compass that it may be dropped into a bucket or tub of hot water for cleansing purposes. It will not sag as easily as the woven-wire mattress, and when one of the springs becomes permanently extended it may be easily replaced at a very slight cost without disturbing the mattress. Another advantage of this mattress is that it can be very easily repaired at posts by available mechanics, and does not require any expert labor to place the mattress on the frame.

TARIFF OF SIZES.

To prevent the accumulation of an undue proportion of sizes of the new clothing, and to secure reliable data upon which to base an estimate as to the number of garments of each size that should be carried in stock and held ready for issue, the Quartermaster-General recommended to the Chief of Staff the publication of a general order requiring post commanders to cause the enlisted men at the respective posts to be carefully measured, with a view to ascertaining the exact size of each of the garments worn by them, and the proportion of each size to the total number. War Department General Orders, No. 102, of June 14, 1904, is the result. It directs that the desired measurements be taken, that comparison of each be made with the sizes as furnished by the Quartermaster's Department, and that the result be communicated direct to the Quartermaster-General. Similar reports are to be rendered also on July 1, 1905.

HARBOR BOAT CLOTHING.

The subject of providing a suitable uniform for the officers and crews of the harbor boats has been considered. Standards have been adopted and detailed specifications prepared. It has also been decided to provide all such boats with pennants, and the purchase of a sufficient number is now being made after specifications prepared by this office.

DEDUCTIONS IN PRICES OF CLOTHING AND EQUIPAGE ON ACCOUNT OF DELAYED DELIVERIES.

The deductions at the several clothing depots during the past fiscal year, in the contract prices of clothing and equipage supplies on account of delayed deliveries under the respective contracts, amounted to \$50,571.41.

By reason of the increased sizes of quarters now being used the fuel allowance of officers, which was fixed upon when quarters were smaller and the requirements were not so great, is inadequate.

The same condition existed in the new and large enlisted men's barracks and it has been found necessary to authorize extra issues of fuel in order to heat those situated in the more northern latitudes.

At present officers in tropical climates have very little expense for fuel, while those at northern posts in the United States incur heavy bills, and many complaints have been received from them to the effect that their fuel bills were burdensome because of absolutely necessary purchases over and above the regulation allowances to comfortably heat their quarters.

It is therefore recommended that the allowances of fuel for officers' quarters at posts situated between the thirty-sixth and fortieth degrees of latitude be increased by one-half from September 1 to April 30; that north of the fortieth degree, from September 1 to April 30, the present allowance be doubled, and that in all latitudes, from May 1 to August 31, the allowance be doubled to meet the present conditions in the United States.

TRANSPORTATION.

The following statement shows that during the fiscal year ended June 30, 1904, transportation was furnished, exclusive of Army Transport Service, for 820,910 persons, 6,266 animals, and 261,593 tons of material:

	Railroad.	Water.	Wagon.	Stage.	Government vessels. ^a	Total.
Passengers:						
Officers	5,562	515	2	65	29,625	35,759
Men	97,998	10,144	18	607	676,384	785,151
Total	103,550	10,659	20	672	706,009	820,910
Animals:						
Horses	4,326	545			66	4,937
Mules	798	514			17	1,329
Total	5,124	1,059			83	6,266
Stores:						
Subsistence	20,429	6,349	5,093	1	5,007	36,879
Quartermaster	46,394	40,145	26,129	1	21,940	134,609
Ordnance	19,842	4,460	2,504		3,095	29,891
Medical	1,742	199	912		169	3,022
Signal	2,620	577	158		275	3,630
Miscellaneous	17,978	4,469	22,076		9,048	53,651
	109,005	56,179	56,872	2	39,534	261,592

^a This includes all passengers carried on Government ferry boats plying between military posts and adjacent cities.

A consolidation of the reports showing the number of troops and quantity of property transported in the Philippines by railroad, wagon, and water transportation during the fiscal year, shows that there were transported 7,398 officers, 40,078 enlisted men, a total of 47,476 passengers; 1,165 horses, 1,102 mules, a total of 2,267 animals and 512,899 tons of freight.

CONSTRUCTION OF VESSELS.

At the beginning of the fiscal year the construction of vessels under contract was as follows:

Two 130-foot standard steel screw steamers for harbor service of the Quartermaster's Department ordered from the Perth Amboy Ship Building and Engineering Company, of Perth Amboy, N. J., to be completed in 120 and 130 working days, respectively.

Four 150-foot twin-screw steamers for use in connection with the submarine mine service of the Coast Artillery, ordered from the Neafie & Levy Ship and Engine Building Company, of Philadelphia, Pa., at a price of \$122,000 each, to be completed in 190, 215, 235, and 255 working days, respectively.

One 130-foot single-screw steamer ordered from the Maryland Steel Company at a price of \$88,000, to be completed in 140 working days, and designed primarily for the joint use of the Quartermaster's Department and the cable service of the Signal Corps.

One 45-foot steam launch ordered from the Marine Construction and Dry Dock Company, of Mariners Harbor, N. Y., at a price of \$5,750, to be completed in 45 working days.

One 130-foot steel single-screw standard steamer for freight and passenger service in San Francisco Harbor ordered from the Risdon Iron Works June 24, 1903, at a cost of \$110,000, to be completed in 240 working days.

With the exception of the two steamers ordered from the Perth Amboy Company in January, 1903, the contracts for these vessels were entered into shortly prior to the beginning of the fiscal year, and the actual work of construction was at that time but little more than begun.

About this time the Perth Amboy Company became involved in financial difficulties and it was apparent that they would not be able to fulfill the terms of their contract, the contract time having already expired and the construction work having advanced only about 20 and 12 per cent, respectively. After a careful investigation of the case the contract was abrogated and the two uncompleted vessels abandoned and relinquished to the contractors, no payment having been made on account thereof. A claim against the sureties of the contractors is now in the hands of the Department of Justice in order that the interests of the United States may be fully protected.

The construction of the four 150-foot steamers known as the torpedo planters was considerably delayed by the excessive cold of the past winter and by other circumstances beyond control of the contractors and an extension of time of from sixty to ninety days was found necessary. None of the vessels had yet been accepted at the close of the fiscal year, but they were all nearly completed, and it was expected that two or more of the number would be ready for acceptance within a fortnight of the close of the fiscal year. These four vessels will be known, in the order of their completion, by the names *General Henry J. Hunt*, *General Henry Knox*, *Colonel George Armistead*, and the *Major Samuel Ringgold*.

The construction of the 130-foot steamer by the Maryland Steel Company was pushed to completion and the vessel, since named the *General Joseph E. Johnston*, was delivered to this Department early in April last. Although originally intended for use jointly by the Quartermaster's Department and in the cable service of the Signal

Corps, it was later decided by the latter that she would not be suited to their needs. Her contemplated use by the Signal Corps was therefore abandoned and the vessel was placed in the Quartermaster's service in New York Harbor.

The 45-foot steam launch ordered from the Marine Construction and Dry Dock Company was completed August 15, 1903, given the name of *The Captain Page*, and placed in service at Fort Morgan, Ala.

During the fiscal year 1904 the following contracts were entered into:

Two 130-foot standard steel-screw steamers identical in size and pattern to those on which the Perth Amboy Company defaulted, ordered from the Pusey & Jones Company, of Wilmington, Del., December 1, 1903, at a price of \$76,900 each, to be completed in 195 and 225 working days, respectively. The contract time for delivery of these boats is July 20 and August 25, 1904, respectively, and as the work of construction is being pushed with unusual energy and dispatch it is expected that they will be completed and ready for delivery well within the contract time. These vessels have been named in the order of their completion the *General Nathanael Greene* and the *General Thomas S. Jesup*.

One 105-foot wooden single-screw steamer for service in the Puget Sound artillery district, ordered from the Heffernan Engine Works February 12, 1904, to be completed in five months, at a cost of \$21,825. The construction of this vessel has progressed rapidly, and it is anticipated that delivery will be made on contract time. She will be named the *Major Evan Thomas*.

Under date of February 4, 1904, contract was entered into with the Electric Launch Company, of Bayonne City, N. J., for the construction of 120 wooden work boats, designed for use in connection with submarine mine work at various artillery posts, at a price of \$207 per boat, or a total of \$24,840; all boats to be completed and ready for delivery by July 20, 1904. None of them have yet been delivered, but the work is being pushed rapidly, and it is expected that a considerable portion of the boats will be ready for delivery at an early date.

One 30-foot electric launch, for service at the West Point Military Academy, was ordered from the Electric Launch Company March 9, 1904, at a price of \$2,487.75, to be completed in 40 working days. This launch was completed on time, named the *West Point*, and is now in service at the Military Academy.

Three 28-foot electric cutters, designed for use in connection with submarine mine vessels, ordered from the Electric Launch Company, at a price of \$2,575 each; all to be completed in 60 working days. The work of constructing these launches was begun prior to the close of the fiscal year and was then well under way.

The steamer *General Joseph E. Johnston* referred to above, not having been deemed satisfactory to the Signal Corps, efforts were made to purchase a vessel of a pattern suited, or which could be altered at reasonable cost, for cable service of the Signal Corps. The steamer *Margaret*, owned by Eugene S. Belden, of Hartford, Conn., was finally selected and purchased at a cost of \$50,000 early in May. Contract for the necessary alterations to fit her for the proposed service was entered into with the Pusey & Jones Company, of Wilmington, Del., at a cost of \$14,500, to be completed within sixty working days. Work was well under way on June 30. Upon suggestion of the Chief Signal Officer the boat was renamed the *Cyrus W. Field*.

VESSELS PLACED IN SERVICE.

The following vessels have been placed in service during the fiscal year:

Name.	Class.	Cost.
Gen. Joseph E. Johnston	130-foot steel steamer	\$88,000.00
Gen. Miffin	do.	110,000.00
Cyrus W. Field	Cable steamer	50,000.00
Capt. Page	45-foot steam launch	5,750.00
West Point	30-foot electric launch	2,487.75
Alcatraz	Gasoline launch	5,282.00

This Office has endeavored to name all vessels built for the Quartermaster's Department in honor of distinguished deceased quartermasters-general, and those built for the Artillery Corps in honor of distinguished deceased artillery officers.

VESSELS SOLD.

The yacht *Kanawha*, which was transferred from the transport service to the harbor service November 24, 1903, was found unsuitable for the Quartermaster's Department harbor service, and, with the approval of the Secretary of War, was sold on April 3, 1904, for \$19,651.

At the time of the evacuation of Cuba by the United States forces there were two vessels of the harbor service stationed in the island; one, the *Wm. E. Shipp*, a 44-foot steam launch which was captured at the time of the occupancy of Santiago by United States troops, was found to be unfit for service, and was condemned and sold February 5, 1904, for the sum of \$733.

The *Major Edmonds*, a 52-foot launch, was stationed at Habana, Cuba, and in making arrangements for its shipment to the United States it was found that the rates charged by the transportation companies were excessive; the launch was therefore sold to the government of Cuba, with the approval of the Secretary of War, for the sum of \$6,000, which it is believed was a most advantageous method of disposing of same.

The sloop *Esperanza*, which was in Habana at the beginning of the fiscal year, and had been advertised for sale, was sold for \$205, on October 23, 1903, which was the highest bid received.

ARMY TRANSPORT SERVICE.

At the beginning of the fiscal year the following-named army transports were owned by the Department, viz:

Name.	Class.	Service.
Buford	Troop ship	Out of commission, San Francisco.
Burnside	Cable ship	En route to Alaska.
Crook	Troop ship	Out of commission, San Francisco.
Dix	Freight ship	Out of commission, San Francisco.
Ingalls	Transport	In service between Pacific coast and Manila.
Kilpatrick	Troop ship	In service, Philippine waters.
Kanawha	Troop ship	Under orders for voyage from Manila to New York.
Liscum	do.	New York Harbor.
Logan	Troop ship	In service, Philippine waters.
		In service between San Francisco and Manila.

Name.	Class.	Service.
McClellan	Troop ship	Out of commission, New York Harbor.
Meade	do	Out of commission, San Francisco.
Seward	Refrigerator ship	In service, Philippine waters.
Sheridan	Troop ship	In service between San Francisco and Manila.
Sherman	do	Do.
Sumner	do	Under orders for voyage from Manila to New York.
Thomas	do	In service between San Francisco and Manila.
Warren	Freight ship	Out of commission, San Francisco.
Wright	Transport	In service, Philippine waters.
Slocum	Tug	In service, San Francisco Harbor.
Esperanza	Sloop	At Habana, Cuba, under orders to be sold.

During the year there has been maintained a monthly sailing of army transports between San Francisco and Manila, a transport leaving San Francisco on the 1st day of each month, unless that date occurred on Sunday, in which event the transport sailed the preceding day, and a transport leaving Manila for San Francisco on the 15th of each month. Four transports, viz, *Logan*, *Sheridan*, *Sherman*, and *Thomas*, have been employed in this service. The route for transports sailing from San Francisco to Manila is via Honolulu and Guam, and returning via Nagasaki and Honolulu.

In addition to the sailing of the four regular transports it was necessary to dispatch the army transport *Buford* to Manila to transport marines, which sailed from San Francisco on March 10, 1904, carrying 22 officers and 601 men and 36 other passengers; also 563,345 feet of lumber, 35 tons of freight, and 30 tons of mail, and returning arrived at San Francisco on June 15, 1904.

At the close of the fiscal year the *Buford* was under orders to take the Eighth Infantry to Alaska and bring home the Third Infantry.

WORK OF THE TRANSPORTS.

Following is a list of the army transports sailing between San Francisco and the island possessions during the fiscal year, showing the number of passengers carried by each:

OUTWARD BOUND.

Name of transport.	Left San Francisco.	Officers.	Soldiers.	Civilians.	Total.
Sherman	July 1, 1903	60	944	81	1,085
Sheridan	Aug. 1, 1903	38	322	56	416
Thomas	Sept. 1, 1903	32	368	52	452
Logan	Sept. 5, 1903	44	751	90	885
Sherman	Oct. 1, 1903	80	729	83	892
Sheridan	Oct. 31, 1903	49	735	135	919
Logan	Dec. 1, 1903	47	741	91	879
Thomas	Jan. 1, 1904	31	204	83	318
Sheridan	Feb. 1, 1904	19	114	116	249
Sherman	Mar. 1, 1904	45	1,348	80	1,473
Buford	Mar. 10, 1904	23	603	35	661
Logan	Apr. 1, 1904	8	314	104	426
Thomas	Apr. 30, 1904	21	419	67	507
Sheridan	June 1, 1904	19	748	107	874
Total		516	8,340	1,180	10,036

HOMEWARD BOUND.

Name of transport.	Arrived at San Francisco—	Officers.	Soldiers.	Civilians.	Total.
Thomas	July 10, 1903	46	917	131	1,094
Logan	Aug. 9, 1903	65	1,459	110	1,634
Sherman	Sept. 17, 1903	65	1,149	157	1,371
Sheridan	Oct. 10, 1903	62	1,018	80	1,160
Thomas	Nov. 12, 1903	25	314	83	422
Logan	Nov. 15, 1903	41	656	40	737
Sherman	Dec. 15, 1903	52	920	70	1,042
Sheridan	Jan. 13, 1904	58	1,187	87	1,332
Logan	Feb. 12, 1904	56	1,167	63	1,286
Thomas	Mar. 14, 1904	59	1,416	102	1,477
Sheridan	Apr. 15, 1904	54	1,230	133	1,417
Sherman	May 16, 1904	65	1,024	120	1,309
Logan	June 12, 1904	34	337	108	479
Bulford	June 15, 1904	2	11	58	71
Total		684	12,805	1,342	14,831

NOTE.—The civilians transported pertain almost exclusively to the Army, Navy, Marines, the State, Post-Office, and Treasury departments, and the insular government of the Philippines.

On these voyages there was also brought from the Philippine Islands, for interment, the remains of 252 officers, soldiers, and civilian employees. There were transported between the United States and the Philippine Islands 59,552 tons of freight, 452,176 pounds of mail matter, and \$29,060,250 in money. Included in this transportation are 2,090 tons measurement of freight and 21,210,000 pesos in silver currency and silver certificates for the insular government.

At the beginning of the fiscal year the transport *Dix* was en route from Manila to Seattle, and on July 25 ran aground off Kosasima Island, Japan, and was quite extensively damaged. She was repaired at Yokohama, leaving that port August 25.

During the year the *Dix* has had installed upon her spar deck fittings for the transportation of 230 animals. She has made two and one-half round voyages from the United States to the Philippines, on which there have been transported 27,816 tons of freight, which includes 3,064,010 feet of lumber. Also 16 passengers and 223 animals, of which 19 were for the insular government.

At the beginning of the fiscal year the transport *Burnside*, which is fitted up as a cable ship, was en route from the Philippines to Seattle, where she arrived on August 3, 1903. This transport has been used during the fiscal year exclusively in the interest of the signal department for laying and repairing deep-sea cable. After arrival at Seattle in August, 1903, she was engaged in laying cable between that point and Alaska, and on January 1, 1904, sailed from Seattle for Manila, where she arrived February 5, 1904. From that date to April 6, 1904, she was employed in repairing deep-sea cable in the Philippine waters, when she again sailed from Manila for Seattle, arriving May 18, 1904, and has since been employed in completing laying the cable between Seattle and Alaska.

The total cost for maintenance and running expenses of the *Burnside* during the fiscal year is \$131,276.97, and the value of the transportation of passengers and supplies incidentally carried upon the basis of lowest rates offered is \$4,353.50, which leaves an expenditure of \$126,923.47 from the appropriation of the Quartermaster's Department in the interest of the signal department.

The transports *Crook*, *Meade*, and *Warren* have been out of commission in San Francisco Harbor during the entire fiscal year. During the year they were necessarily put in thorough condition to go into service under emergency, and there was expended for this purpose and for their care and preservation the sum of \$71,262.18. The *McClellan*, out of commission during the year in New York Harbor, was for the same reason fitted up and prepared for service, the total expenditure for repairs, care, and maintenance being \$53,139.93.

At the beginning of the fiscal year the army transports *Kilpatrick* and *Sumner* were in Manila under orders to sail for New York to bring to the United States the Fifth United States Infantry. The *Kilpatrick* sailed on July 2, 1903, with 403 passengers on board, and arrived in New York on September 12, 1903. She also brought the remains of 302 persons, and 3,000 tons of freight.

The *Kilpatrick* returned to the Philippines, leaving New York December 20, 1903, and returning arrived in New York on May 22, 1904. On these voyages she carried 48 officers, 702 enlisted men, and 229 civilians, the remains of 64 officers, soldiers, and civilian employees, and 5,803 tons of freight.

In October, 1903, this vessel made a voyage to Cuba and return to bring to the United States a portion of the United States troops still remaining on the island, on which she carried 13 officers, 367 enlisted men, and 24 civilians, a total of 404 passengers. She carried to Cuba 265 tons of supplies, and brought from Cuba 1,486 tons of freight.

The transport *Sumner* sailed from Manila for New York on September 17, 1903, arriving at the latter port November 21, 1903, with 21 officers, 196 troops, and 46 civilians, 162 remains of officers, soldiers, and civilians, and 114 tons of freight.

On January 25, 1904, the *Sumner* sailed from New York for Cuba to bring to the United States troops serving there. On this voyage she carried 3 officers and 10 civilians, and returning carried 9 officers, 325 soldiers, and 49 civilians; the remains of 5 persons, 1,410 tons of freight, and 20,400 pounds of ammunition.

The transports *Kilpatrick* and *Sumner* left New York on June 12, 1904, for Porto Rico to transport thence to the United States the 600 Porto Rican teachers and their attendants, as authorized by resolution of Congress approved February 12, 1904. On this trip the *Kilpatrick* carried from New York to San Juan 9 passengers, and returning brought 392 passengers from San Juan to Boston; and the *Sumner* on this voyage carried 333 passengers and also 8 tons of freight. The *Kilpatrick* arrived in Boston from Porto Rico with the teachers and their attendants on July 2, 1904, and the *Sumner* arrived in New York on July 1, 1904. The reported cost for the services of these two vessels for these voyages is: *Kilpatrick*, \$14,058.28, and *Sumner*, \$18,969.18, a total of \$33,027.46.

The transport *Kanawha*, which was purchased by the War Department from the Navy Department December, 1899, at a cost of \$50,000, paid for from the appropriation for national defense and sent to Cuba for use in the customs service, and subsequently transferred to the army transport service, was, during a portion of the fiscal year, in service in New York Harbor. There was expended for repairs and running expenses of the vessel the sum of \$7,462.81, and later she was sold.

The army transports *Ingalls*, *Liscum*, *Seward*, and *Wright* have been in service during the year in the Philippines. The *Ingalls* has been employed as a dispatch boat for the commanding general, Philippines Division, and the reported cost for her repair, maintenance, and running expenses is \$70,836.98.

On the three other transports in the interisland service there have been transported the following: *Liscum*, 195 officers, 1,965 enlisted men, and other passengers, 6,926 tons of freight, and \$705,459.25 in money, and 19 animals; on the *Seward*, 166 officers, 943 enlisted men, and other passengers, 2,580 tons of freight, and \$912,551.79 in money; on the *Wright*, 133 officers, 752 enlisted men, and other passengers, 1,419 tons of freight, and \$116,609.22 in money, making a total movement by these three interisland transports of 4,154 passengers, 10,925 tons of freight, 19 animals, and \$1,734,620.36 in money. There were also transported 2,993 sacks of mail matter. The cost for repairs, maintenance, and running expenses of these three transports was \$177,887.98.

PASSENGER AND FREIGHT MOVEMENT.

Following is a summary of the movement of passengers and freight by army transports during the fiscal year:

Passengers:

San Francisco to Manila	9,606
San Francisco to Honolulu	258
San Francisco to Guam	95
New York to Manila	773
New York to Cuba	16
New York to Porto Rico	9
Honolulu to Manila	1
Guam to Manila	103
Manila to San Francisco	14,291
Manila to New York	872
Manila to Nagasaki	105
Manila to Honolulu	14
Nagasaki to Honolulu	5
Nagasaki to San Francisco	199
Honolulu to San Francisco	230
Cuba to the United States	784
Porto Rico to the United States	725
Total	28,086

Of the above, there were carried for the Navy Department 428 persons, for the insular government 334 persons, for the Treasury Department 7 persons, for the Post-Office Department 3 persons, for the State Department 1 person, and for the Department of Justice 2 persons.

Freight:

	Tons.
From the United States to the island possessions in the Pacific	78,000
From the island possessions in the Pacific to the United States	18,911
From the United States to Cuba	265
From Cuba to the United States	2,896
From Porto Rico to the United States	8
Total	100,080

Included in the above-mentioned freight transported to the island possessions in the Pacific are 3,627,355 feet of lumber. There was also transported from the island possessions to the United States the

remains of 785 officers, enlisted men, and civilians, and also \$29,060,250 in currency and silver certificates, of which sum 21,210,000 pesos were transported for the insular government in the Philippines.

Of the above-mentioned freight there were transported for the Navy Department 746 tons, for the Post-Office Department 893 tons, and for the insular department 2,090 tons.

EXPENDITURES FOR TRANSPORT SERVICE.

There was expended during the fiscal year—

For fitting and repairs	\$309,072.84
For coal and other supplies furnished	563,695.80
Total	872,768.64

Stewards' supplies, such as silverware, glassware, china, tinware, table and bed linen, are purchased under contract and kept in stock for issue. During the fiscal year there was expended for such purchases \$33,009.02. As these articles are issued to the transports their cost is taken up and reported by the transport quartermasters as an expenditure for the maintenance of the transports, and such of these articles as have been issued during the past fiscal year are included in the above statement of expenditures for coal and other supplies.

A careful and exhaustive compilation of expenditures made on account of the army transport service during the fiscal year, which includes fitting and repairs, coal and other supplies, salaries of all officers, wages of crews and other employees on the transports, and the maintenance and running expenses, also the salaries of officers on shore duty connected with the army transport service, with their commutation of quarters, the wages of employees in offices and on shore employed in connection with the transport service, cost of embarkation and disembarkation of passengers, loading and unloading freight, wharf hire, and in fact all expenditures which can properly be charged against the army transport service, shows that there have been expended \$3,074,024.08.

The value of the work performed by the army transports in the transportation of passengers, freight, remains of officers, soldiers, and employees, mail matter, and animals, upon the basis of the lowest obtainable rates offered for the same service, was \$3,472,260.58. This shows a difference in favor of the army transport service of \$398,236.50.

DEDUCTIONS.

In considering this report upon the cost to the Government of the army transport service, it is to be borne in mind that the earnings have, in addition to supporting the service and leaving a margin of \$398,236.50, also kept in good condition the reserve fleets in San Francisco and New York harbors, which have been available at all times for any service which they might be called upon to perform.

The total cost of caring for these idle transports has been \$126,402.11, which in the above statement has been charged against the army transport service.

The cost of the army transport *Burnside*, to the amount of \$126,923.47, which was employed exclusively in laying cable in connection with the work of the Signal Corps; the cost of the *Ingalls*, \$70,836.98, which was used exclusively as a dispatch vessel, and in no wise served the

purposes of the Quartermaster's Department, and the cost of the *Kanawha*, \$7,462.81, which was also used as a dispatch vessel, should properly be deducted from the total cost of the army transport service. The two latter were, as a matter of fact, harbor boats, and not a part of the army transport service.

It would seem also that the cost of the transports in carrying Porto Rican teachers to and from the United States, \$33,027.46, should not be charged against the transport service.

The above expenditures, which, while heretofore treated as charges against the army transport service are not considered to be properly so, for the reasons given, amount in the aggregate to \$364,652.83, and if this charge were removed and placed where each item of it properly belongs would increase the earnings of the transport service by said amount, or to \$762,889.33.

Another year's experience has only tended to confirm and emphasize the views expressed in my last annual report as to the utility, economy, and necessity of the army transport system and the wisdom of continuing our present policy in its operation.

TRANSPORTATION IN THE PHILIPPINES.

There were in service in the Philippines 2 transports, 6 steam lighters, and 48 launches, owned by the Quartermaster's Department. These vessels were stationed at different ports in the Philippines and employed in the transportation of passengers and supplies from one port to another, as required. There have been transported on these vessels during the fiscal year 24,968 passengers and 19,172 tons of freight. The expenditures for operation and maintenance of these vessels during the fiscal year are reported as follows: Wages of crews, \$172,872.40; supplies, \$95,353.11; repairs, \$118,469.62; total, \$386,695.13.

There have been in service under charter from time to time during the fiscal year in the Philippines 22 vessels, for which there have been paid for charter \$571,812.50; for supplies furnished \$103,675.62; for repairs \$2,792.40. A total expenditure of \$678,280.52. The number of passengers and freight transported by these vessels is as follows: 11,689 passengers; 33,646 tons of freight; 1,194 animals; 2,482 sacks of mail; \$432,123.21 in money.

There have also been under charter at various periods during the year 10 launches, the cost of which for charter has been \$10,872.70; for supplies furnished, \$1,122.12—a total of \$11,994.82.

It is impossible from the tables submitted by the Chief Quartermaster, Philippines Division, in his annual report to intelligently segregate the inter-island transport service from river and harbor service, but in response to a telegraphic inquiry from this office he states that the inter-island transport service has cost \$878,763.14, and that at commercial rates the same service would have cost \$1,069,103.34, a balance in favor of the inter-island transport service of \$190,367.20.

BARRACKS AND QUARTERS APPROPRIATION.

Congress, by act of March 2, 1904, making appropriations for the support of the Army for the fiscal year 1904, provided, under the head of "Barracks and quarters," \$4,750,000. Of this amount \$2,000,000 was made immediately available, and to comply with

requirements of the Treasury Department a separate account has been kept of the \$2,000,000 under the head of "Barracks and quarters, 1903 and 1904," the remaining \$2,750,000 being taken up under the head of "Barracks and quarters, 1904." The two appropriations are combined in one, and the expenditures made or authorized therefrom are approximately as follows:

Authorized for construction of buildings at army posts and general depots.....	\$3,607,431.33
Authorized for repairs to same, also for minor alterations and extra work on buildings, etc.....	761,610.61
Expended for rents and hire of employees.....	320,608.59
Authorized for construction of wall lockers in barracks.....	55,735.82
Balance unallotted.....	4,613.65
Total accounted for.....	4,750,000.00

All of the expenditures above reported were made for buildings in the United States, except \$1,975 for construction of shelter for legation guard in Peking.

MILITARY POST APPROPRIATION.

In the sundry civil act approved March 3, 1903, Congress appropriated under the head of "Military posts" \$1,500,000. There was an available balance on July 1, 1903, from prior appropriations of \$61,825.05, making a total of \$1,561,825.05 available for expenditure in the fiscal year 1903-4. Of this amount \$1,547,837.07 has been apportioned at various posts, leaving an unexpended balance of \$13,987.98.

POST EXCHANGES.

There was appropriated by act of March 3, 1903, under the head of "Barracks and quarters" \$500,000. Of this sum there has been allotted for construction and repair of buildings, plumbing, heating and lighting, gymnastic apparatus, furniture, printing, and advertising \$488,935.27, leaving an unexpended balance on June 30, 1904, of \$11,064.73, which will be required for proposed work at other posts.

HOSPITALS.

There was appropriated in the army appropriation act for the construction and repair of hospitals, \$475,000, which included \$60,000 for the construction of a hospital at Vancouver Barracks. From this amount funds have been allotted upon recommendation of the Surgeon-General for construction of hospitals in the United States (including the one for Vancouver Barracks), and for repairs, amounting to \$473,573.45, leaving an unallotted balance of \$1,426.55.

HOSPITAL STEWARDS' QUARTERS.

Of the \$15,000 appropriated for this purpose there remained at the close of the year an unallotted balance of \$94.33.

OTHER APPROPRIATIONS USED FOR CONSTRUCTION.

There were expended, through the construction and repair division, \$595,655.22 of the appropriation "Regular supplies," for heating and lighting apparatus, construction of bakeries, bake ovens, and other buildings, and constructing and repairing reservation fences, etc.,

\$2,321,202.26 of the "Army transportation" appropriation for plumbing, drainage, water, and sewer systems, roads, walks, grading, bridges, construction, and repair of wharves, boathouses, and other miscellaneous purposes; \$146,948.45 from the appropriation for "Incidental expenses," for box and wall lockers, flagstaffs, refrigerators, trees, grass seed, electrical supplies, etc.

In addition to the foregoing a number of special appropriations for certain designated posts, amounting in the aggregate to \$1,515,000, were provided by Congress.

APPROPRIATION FOR BARRACKS AND QUARTERS, PHILIPPINE ISLANDS.

Appropriated by army act of March 2, 1903.....	\$500, 000. 00
Balance available from prior appropriations on July 1, 1903, approximately	60, 190. 83
Total	560, 190. 83
From this amount there was remitted to the Philippines to June 30, 1904.....	195, 000. 00
Expended or allotted for purchase of building material in the United States	127, 709. 23
Balance June 30, 1904	237, 481. 60
Total accounted for	560, 190. 83

HEAVY FURNITURE FOR OFFICERS' QUARTERS.

In my estimate of appropriations for the Quartermaster's Department for the fiscal year ending June 30, 1906, I have included an item of \$300,000, under the heading "Regular supplies," for the purchase of heavy furniture for officers' quarters.

I can not too strongly urge that this subject be brought to the attention of Congress with a view to obtaining its favorable consideration by that body and an appropriation for carrying the project into effect. In the frequent and often long moves that officers of the Army are required to make under orders their household furniture is often badly damaged in transit. The saving in cost in the transportation of such furniture, which the Government has to pay on an officer's change of station, as well as in the cost of packing and crating these articles, which are difficult to handle, will be considerable.

Furniture of the class it is proposed to supply, and which each officer now has as his private property, is, as a rule, not well adapted to use in the Philippines; hence officers ordered to stations there must either dispose of such property at a sacrifice or secure storage for it.

While the original outlay will be an expense to the Government it will eventually be an economical move and is so regarded, it is believed, by other departments of the Government which furnish similar articles for use in quarters.

ALLOWANCE OF QUARTERS TO OFFICERS.

It has for some years been realized that a readjustment of the allowances for quarters and rates of commutation was very desirable, and it is becoming all the time more urgent. The matter came up last year in hearings before the committees of Congress, when I explained some of the conditions confronting officers on duty where quarters are unavailable and consequently the acceptance of commutation in lieu

thereof is necessary, and it was then suggested that the matter be taken up in my annual report, the conditions fully set forth, and recommendations looking to an equitable revision made.

The number of rooms allowed is fixed by regulations according to rank, and has been the same for more than a generation, having been fixed in the regulations of 1862, forty-two years ago, when the cost and manner of living were very much below the standard of the present.

The commutation allowance of \$12 per room was established by act of Congress approved June 17, 1878, previous to which time the rate seems to have been fixed by the Secretary of War. At the close of the civil war the rate was \$18 per room, which allowance remained in force until the passage of the act.

The prevailing rates of pay for officers of the Army were fixed by the act of Congress approved July 15, 1870. There has therefore been no increase in pay for more than thirty-three years, while, as shown above, the rate of commutation of quarters has actually been reduced one third during that period, and at the same time the cost of living, especially in the matter of rents, has been enormously increased.

Necessarily a large number of officers are detailed to cities where public quarters may not be provided. While upon such details an officer is actually subjected to a practical reduction in his pay, for the reason that his commutation is not sufficient to rent for him suitable quarters.

It is believed that few, if any, of the officers now on service that requires them to hire quarters and draw commutation therefor as fixed by regulations are able to provide themselves with suitable quarters for the amount allowed.

As the price per room and the number of rooms allotted each officer are fixed by law, it is not possible to prescribe regulations that will alter the same. The matter can be corrected either by increasing the number of rooms hitherto allowed to officers or the amount of commutation per room.

I respectfully recommend that, rather than increase the commutation, the number of rooms allowed be increased as follows:

Rank.	Present allotment.		Proposed allotment.		Increased cost.
	Rooms.	Cost.	Rooms.	Cost.	
Second lieutenant.....	2	\$24.00	2	\$24.00	.....
First lieutenant.....	2	24.00	3	36.00	\$12.00
Captain.....	3	36.00	4	48.00	12.00
Major.....	4	48.00	5	60.00	12.00
Lieutenant-colonel.....	4	48.00	6	72.00	24.00
Colonel.....	5	60.00	7	84.00	24.00
Brigadier-general.....	5	60.00	8	96.00	36.00
Major-general.....	6	72.00	10	120.00	48.00
Lieutenant-general.....	6	100.00	12	144.00	44.00

The allotment of quarters to officers of the service in the proportion proposed will be in near relation to the present allowance of quarters at military posts and will enable officers serving in cities and at places where the Government does not own quarters to rent suitable quarters for something near the amount of commutation, removing the necessity of drawing upon private funds or curtailing the regular pay of the officer in order to make up the deficiency for rent.

Therefore, taking into consideration the conditions above described, the allowance recommended is deemed reasonable and the money allowance no more than sufficient to rent very modest quarters for officers of the Army serving in cities.

TRAVELING EXPENSES OF OFFICERS ON DEPARTMENTAL DUTY.

It is recommended that existing laws be so modified as to authorize the Quartermaster-General to order officers to make necessary journeys in connection with the work of the Department and direct payment of their actual traveling expenses in lieu of mileage from the appropriation to which the travel pertains. This would enable a closer inspection to be made of important construction work and the manufacture of supplies of various kinds, by rendering more elastic the method of detail of officers, and would relieve the mileage appropriation of the pay department from the charge for such work, placing it where considered to properly belong—against the immediate object for which expended. Under existing laws and decisions this is not possible.

MEMORIAL BRIDGE ACROSS THE POTOMAC.

For nearly twenty years the construction of a bridge from some location on the Washington side, about the terminus of New York avenue and Observatory Hill, to a suitable location on the Government reservation on the Virginia side of the Potomac River has been considered at different times. In the years 1885 and 1890 resolutions were passed by the United States Senate directing the Chief of Engineers to report upon the construction of such a bridge and its approximate cost; and, though bills were introduced in the Senate at the second session of the Fifty-second Congress (Senate bill 796) and at the first session of the Fifty-third Congress (Senate bill 702), no appropriations appear to have been made for the purpose of seriously undertaking the construction of this most necessary bridge until the act of Congress approved March 3, 1899, which provided as follows:

Memorial bridge across Potomac River: To enable the Chief of Engineers of the Army to continue the examination of the subject and to make or secure designs, calculations and estimates for a memorial bridge from the most convenient point of the Naval Observatory grounds or adjacent thereto across the Potomac River to the most convenient point of the Arlington estate property, the sum of five thousand dollars.

Under this act two tentative lines were established for the position of the bridge and competitive designs submitted to and acted upon by a board of engineer officers. Here again, however, the matter seemed to rest.

Inasmuch as the Government reservation occupied by the Arlington National Cemetery and the post of Fort Myer, Va., are by law in charge of the Quartermaster's Department, under the direction of the Secretary of War, attention is again invited to the necessity for the erection of a suitable bridge, which will furnish a direct route from the city of Washington to these places.

It is appropriate that this bridge should be memorial in character, as it will be a direct connecting link between the national capital and Arlington National Cemetery, the final resting place of so many of our illustrious soldier dead, whose hallowed precincts and patriotic asso-

ciations appeal strongly to residents and visitors of the national capital. All visitors to this national cemetery are now obliged to journey thither by a circuitous route through most uninviting and disagreeable surroundings at each approach to the bridge across the river; and, aside from any sentimental or patriotic consideration, the proposed new bridge has now become an absolute necessity to render those points more accessible to the great numbers of people who annually visit them and who are entitled to have the consideration shown them of providing for their use a direct and suitable route thereto.

The necessity and value, from a military point of view, of a bridge at this place are most apparent, and, therefore, it is earnestly recommended that an appropriation be asked from Congress for its construction at or about the terminus of New York avenue and Observatory Hill, which bridge when constructed will not only furnish a direct route to the national cemetery, but also be the means of direct and rapid communication between the Capital and the important military post of Fort Myer, Va., adjoining the cemetery on the north.

NATIONAL CEMETERIES.

There are now 83 national cemeteries. The interments therein to June 30, 1904, were, known, 197,869; unknown, 151,983—total, 349,852, being an increase of 1,785 during the year, including remains of officers and soldiers returned from abroad.

Removals of remains of 110 officers and enlisted men from abandoned post cemeteries and other places within the United States were made during the year to national and other cemeteries. Nine thousand and eleven white marble headstones were provided to mark the graves of known Union soldiers, sailors, and marines in national, post, city, and village cemeteries, and a granite tablet with the name of each soldier inscribed thereon was erected in the post cemetery at Fort Assiniboine, Mont., to mark the grave in which the remains of 21 United States soldiers of the Second and Seventh Cavalry and Fifth Infantry, who were killed in action with Indians at Bear Paw, Mont., September 30, 1877, and whose remains were reinterred August 22, 1903.

For repair and preservation of the monuments, tablets, etc., within the limits of the Antietam battlefield and pay of superintendent thereof, \$4,500 has been expended.

There have been available during the year for repairing and improving the Government roadway to the national cemetery near Springfield, Mo., \$23,634; for repairing roadways to different national cemeteries, \$15,000; for purchase of additional land for Loudon Park National Cemetery, \$15,000; for Confederate Mound, Oakwood Cemetery, Chicago, \$3,850, and for Confederate cemetery, Camp Chase, Ohio, \$3,600.

DISINTERRING CORPS.

The work of the disinterring corps in the Philippine Islands has been continued and has progressed satisfactorily. During the year there were received in the United States from various stations, including China, Japan, Hawaii, Alaska, and Cuba, the remains of 855 officers, soldiers, sailors, marines, and civilians. Of these, 445 were forwarded to relatives or legal representatives, and 394 were interred in national cemeteries.

MEMORIAL AMPHITHEATER, ARLINGTON, VA.

At the last session of Congress I submitted an estimate of \$5,000 for the preparation of plans for a suitable memorial amphitheater to be erected on the grounds of the Arlington National Cemetery at a cost of \$250,000 for the exercises held on each Memorial Day, and for such other appropriate ceremonies as might be held there from time to time.

This project, which I heartily approve, originated with the Department of the Potomac, Grand Army of the Republic, and as action thereon was not taken by Congress before its adjournment, I have renewed my estimate with the hope that it may receive favorable consideration and action at its next session.

ARMY MANEUVERS.

In connection with the combined Army and Navy maneuvers in the vicinity of Portland, Me., August 23 to 30; the joint Regular Army and Militia maneuvers at West Point, Ky., from September 25 to October 16, and at Fort Riley, Kans., from October 14 to 31, 1903, the demands upon the Quartermaster's Department covered almost the entire range of its duties.

Water-supply systems had to be provided at points where troops were encamped, and it has been the policy of this Department to supply water in the most satisfactory manner possible, as it is desirable that no risks be taken in the health of commands, as would be the case if an inadequate or imperfect water supply were furnished. As a consequence, water was hauled and piped in connection with the maneuvers at Portland, Me.; wells were sunk at West Point, Ky., and water was piped to all commands at Fort Riley, Kans.

It was necessary for this Department to anticipate the needs of these encampments as to wood, bedding for enlisted men, sewerage, garbage, sinks, terminal railroad tracks, bathing facilities, transportation facilities for all classes to and from, camp equipage, provision for large numbers of visiting officers of the National Guard properly authorized, location of camp site and distribution of commands upon the camp site, provision for drainage and necessary temporary roadways, requirements for messing facilities for a large number of visiting officers, division officers, umpires, etc.; temporary bakery, provision for camp equipage, etc., for all unorganized bodies and temporary field depots for furnishing such supplies as are absolutely necessary for the period of the encampment.

In addition it was necessary to make contracts and provide for furnishing such regular supplies as are consumed in a temporary encampment of such character, provision of wheeled transportation, the handling of baggage and freight, railroad facilities and terminals, as well as all the internal arrangements for the same.

In order that these provisions could be carried out without arriving at cross purposes it was necessary to furnish commanding officers of all organizations arriving in camp with additional information, as far as possible, of what would be expected. Commanding officers at home stations were instructed as to the importance of designating an experienced officer as quartermaster and detrainning officer, and such commanding officers of all commands in the encampment were instructed

as to just what camp equipage and field equipage they would be entitled to bring into camp, and all other equipage was prohibited. In spite of this, however, some commands brought large quantities of equipage in excess of that provided in orders. It is believed a more careful observance of orders in this respect should be required of all organizations in such encampments, as the training afforded in these maneuvers is a guide for active service, and if luxurious notions are permitted to prevail at camps of maneuver it will result in their being extended to times of actual field service, to the detriment of the mobility of the forces.

In order to furnish suitable instructions to inexperienced commanding officers before leaving home stations, and to insure as complete an understanding as possible of the work for which this Department is responsible, the following provisions were made in memoranda:

(1) Designation of an experienced officer as quartermaster and a detraining officer, and furnishing detailed instructions as to what would be expected of him, manner of conduct on board, etc. (2) Method of loading baggage on cars. (3) Necessary provision for employing needed wagon transportation. (4) Details as to the making up of trains and consolidating them en route. (5) Care of property en route. (6) Detailed instructions as to detraining. (7) Instructions as to the personal supervisions of the commanding officer. (8) Disposition of railway equipment on detraining. (9) Blueprints and sketches of terminal stations. (10) Instructions as to the method of procuring wagon or animal transportation in camp. (11) Instructions as to placing the detraining officer of the command in touch with the detraining officer of the camp. (12) Instructions as to working details in handling property.

Immediately upon arriving in camp, quartermasters of all organizations were furnished with a memorandum indicating the methods to be pursued in providing for the usual camp appliances and method of procedure in drawing supplies, etc.

Provisions for the return journey were made well in advance. Information showing the equipment to be furnished each commanding officer, the number of each train and its location on the tracks and the makeup of the train, schedules showing the time of departure and from what point each train would be dispatched. Carefully prepared instructions as to where and in what manner bills of lading for equipage accompanying each movement of troops would be completed, together with other necessary instructions in detail, were furnished commanding officers and quartermasters well in advance before breaking camp. Quartermasters and commanding officers were instructed to notify connecting lines by wire of the hour at which their trains would arrive at junction points, giving the number of men, the amount of baggage, equipment, etc., in order that prompt service might be insured.

The following synopsis of arrangements at Fort Riley explains the method of distributing troops:

The first embarkation of troops occurred on the morning of the 27th of October. The schedule prepared for the entraining of the various militia organizations allowed three hours and thirty minutes; the time actually consumed was three hours and twenty-five minutes for 21 trains, several of which were doubled as far as Manhattan going east and Junction City going west. These 21 trains distributed troops to nearly

200 different points, and all agents of railroads at connecting points were notified by the chief quartermaster of the time of departure. The trains were dispatched at intervals of fifteen minutes, and with a single exception there were no delays. Circulars and memoranda were furnished by the chief quartermaster with the view to expedite and systematize the entraining of troops as well as freight, furnishing the time that freight and baggage cars would be available for loading; also instructions to inexperienced officers as to the manner of completing bills of lading. The make-up of all trains was prepared and furnished to the proper railroad officials, indicating also the direction in which trains were to be headed and the manner in which freight, baggage, and passenger equipment should be combined. The following memorandum is taken from the report of the chief quartermaster at Fort Riley:

The entraining and detraining of troops should be accomplished as provided in official manual and according to local orders. Prior to entraining of each organization the commanding officer should designate the officer who will have charge of the entraining and detraining. This officer should be designated as an assistant to the quartermaster, as the latter will necessarily have to make the material and business arrangements for the movement, and the details of the work should all harmonize. The labor of loading and unloading the baggage and equipage of the organizations should be performed by a detail of enlisted men. The officer in charge of the entraining should have supervision of the work of the details engaged in loading and unloading the equipage and supplies, and the same detail that loads the property should again be made available for unloading, and he should have definite instructions as to the time, place, and manner of reporting to the officer in charge of the detraining.

A noncommissioned officer from each organization should be in immediate charge of all property and supplies required for early use in the camp. All property and baggage that is not to be carried by the men on leaving the train must be placed in baggage and freight cars, so that when the troops leave the passenger coaches they will be entirely empty. The freight and baggage cars will be at the head or tail of the train, usually next to the engine, and the passenger coaches and sleepers will be solid in another part of the train, so that on arriving at the point of detraining the freight and baggage cars can be cut loose from the passenger portion of the train and the latter can be immediately released and carried out of the way to make room for succeeding trains. Not more than ten minutes should be allowed for the detraining of the troops from any train, and less than five minutes should be sufficient. The freight and baggage cars will be placed on spurs or side tracks near by, and will be unloaded as promptly as possible in order that the empties may be carried by the railroad company to some more or less remote spare tracks for storage.

The officer in charge of detraining the troops should be an assistant to the chief quartermaster of the camp, or the latter officer himself should have charge of this work. If a separate staff officer is designated to perform this work, he should be in the closest possible touch with the chief quartermaster, in order that all provisions necessary may be fully understood and necessary arrangements made. This officer should be provided with a streamer or other device indicating his location, so that he can at all times be promptly located. A suitable streamer, bearing device of the Quartermaster's Department, will be provided by this Department. The officers of arriving troops should be notified of the character of the device, so that it may be immediately recognized. All troops should carry with them their shelter tents and necessary equipment to enable them to bivouac in case they arrive in the night or too late to obtain their baggage and camp equipage before the following morning. Chief quartermasters will prepare such detailed instructions for the guidance of quartermasters and acting quartermasters as will enable them to fully understand all the details connected with this important subject.

If operating over a single line of railroad, those organizations going in the same direction should be first to be dispatched before commencing to dispatch any that are to go in the opposite direction. Also, in arriving, those coming from the same direction or the same district should be the first to be received before allowing others coming from an opposite direction to enter the single line of track.

It will be found that observance of these rules will avoid blocking, and expeditious movement of the troops and supplies will prevent delays.

The total expense of these maneuvers, including cost of regular supplies, incidental expenses, barracks and quarters, transportation of the Army and its supplies, clothing and equipage, amounts to the following:

Portland, Me.—Regulars, \$95,442.22; militia, \$9,868.27; total, \$105,310.49.

West Point, Ky.—Regulars, \$92,572.15; militia, \$100,962.25; total, \$193,534.40.

Fort Riley, Kans.—Regulars, \$116,752.01; militia, \$62,288.71; total, \$179,040.72; making a grand total of \$477,885.61.

The total expenditure on account of regular troops was \$304,766.38, and on account of militia, \$173,119.23.

In addition to this, there was expended for lease of land and damage to land and property at West Point, Ky., as follows: Lease of land, \$1,382.58; damages, \$2,837.24. At Fort Riley, Kans.: Lease of land, \$4,185.86; damages to property, \$3,012.70, making a total for lease of land of \$5,568.44, and for damages to property, \$5,849.94, which, added to the figures given as paid out for regular troops and militia, makes a grand total disbursed by the Quartermaster's Department, on account of maneuvers for the fiscal year 1903, of \$489,303.99.

In addition to the \$50,000 heretofore appropriated for the payment of claims of artillery and cavalry officers and private soldiers of the Confederate Army for horses, side arms, and baggage taken from them by Federal troops at and after the surrender at Appomatox, in violation of the terms of surrender, there were appropriated by acts approved March 3, 1903, and April 27, 1904, the further sums of \$50,000 and \$125,000, respectively, for this purpose.

Up to and including June 30, 1904, 1,974 claims of this nature were received in this office, of which 1,185, amounting to \$157,841.70, have been authorized to be paid, leaving an available balance of \$67,158.30 for payment of remaining claims.

A large number of claims and accounts of a miscellaneous character has been received in this office, investigated and disposed of. There has also been received at this office a large number of claims for damages inflicted by troops in the Philippine Islands, and in Cuba during the military occupation of that island by the United States Government. These claims are being investigated as fast as the press of current business and the inadequate clerical force of the office will permit, and will be eventually submitted for the action of Congress.

ACCOUNTS AND RETURNS.

There were received during the year from disbursing officers of the Department 7,802 accounts, showing the disbursement of public funds. There were forwarded to the Auditor for the War Department during the year 7,498 of these accounts, which had been examined and passed upon by this office.

There were received during the year 3,507 property returns from officers of the Army, of which 3,474 were examined in the office and disposed of. This examination involved the writing of 10,834 letters.

CORRESPONDENCE.

There were 147,862 communications received in this office during the year and 126,739 letters, telegrams, and indorsements sent there-

from. Of the above there were received on subjects pertaining to the civil service 7,100 letters and indorsements, and 9,700 letters and indorsements on the same subject were sent from the office, making a total of 16,800 communications.

PERSONNEL.

The personnel of the Quartermaster's Department comprises 96 officers, divided according to rank as follows: 1 brigadier-general, 6 colonels, 9 lieutenant-colonels, 20 majors, 60 captains, 200 post quartermaster-sergeants, and a practically innumerable civilian force distributed throughout the United States and the insular possessions.

The officers of the department have rendered earnest and efficient service during the past year, and the result of their labors reflects great credit upon the corps and the service generally as well.

PERMANENT APPOINTMENT AND DETAIL OF OFFICERS.

The adoption is recommended of the system of permanent appointment of commissioned officers of the department to include 30 of the 60 captains; that 30 of the captains be detailed as now provided by law, and that the law be so modified as to allow also the detail of first lieutenants of the line, they to have the rank and pay of captains, mounted, while so serving; that appointments to vacancies in the other 30 captaincies be made by selection from those serving or who may have served as detailed captains in the corps, or as regimental quartermasters.

The duties of a quartermaster are of such a nature and so great a scope as to constitute a profession in themselves, and, even after proper appointments have been made, can only be learned by close application and long experience; therefore, the longer an officer serves in the department the more efficient he becomes and, consequently, the more valuable to the service in general. The necessity of efficient service in this department and of affording it the fullest possible scope to secure and retain the talent most fitted for its conduct are too obvious to require argument, and it is not considered the present system is affording that opportunity.

POST QUARTERMASTER-SERGEANTS.

The number of post quartermaster-sergeants authorized by law and in service at the close of the fiscal year was 150. Congress at its last session increased the number to 200. There are at present about 150 military posts in the United States occupied by troops. The larger posts should each have two post quartermaster-sergeants, and 100 at least could be advantageously used in the Philippines.

I therefore renew my recommendation that the number of this class of noncommissioned staff officers be increased to 250, and that the 50 additional be designated post quartermaster-sergeants of the first class, whose rank, pay, and allowances shall be the same as that of hospital sergeants of the first class.

The annual report for the year 1902-3 outlined the requirements for eligibility for appointment as post quartermaster-sergeants. Recently the Quartermaster-General has had opportunity to again personally see considerable of what these sergeants are called upon to do, and the results of the work, and he takes pleasure in recognizing that, as a

rule with hardly an exception, the post quartermaster-sergeants now in the Department are intelligent, efficient, faithful men.

GENERAL SERVICE CORPS.

The establishment of a general service corps for the Department has already been carefully considered by this office, and was recommended with details as to its organization in a communication to the Secretary of War, dated February 16, 1904. Briefly, it is desirable on the grounds of efficiency, economy, and discipline, and in time of war or emergency would furnish a body of trained men to instruct and direct appointees from civil life and civilian employees.

The operations of this department are very intricate and much ramified, so that however competent a man may be it requires a considerable time for him to qualify himself in its various branches or to meet conditions which may confront him, and the knowledge and experience necessary to so qualify him can be obtained only in the actual service of the department.

The need of reliable and experienced men who could be made and kept available through such a corps was emphasized in the operations during the Spanish war, when officers of the department were greatly embarrassed and handicapped by the impossibility of securing experienced clerical and other help. Dependence had to be almost entirely upon civilians who had little or no knowledge of army regulations, orders, or the business methods of the department. Through this inexperience more or less confusion resulted, especially in the care and issue of and accountability for public property. The existence at that time of such a corps, the members of which could have instructed and directed the work of employees, would have been of inestimable benefit in expediting work, caring for property, and superintending the handling of supplies, baggage, checking of freight, etc.

The establishment of such a corps and consequent bringing directly under army regulations and orders of a great portion of the force now employed as civilians would establish a steadiness and discipline the need of which has been at times very strongly realized, especially with reference to employees in the land and water transportation branches and among certain classes of artisans, etc.

Such a corps, when organized, could doubtless command the services of many of the better grade of enlisted men through a system of examinations similar to that now so successful in the selection of post quartermaster-sergeants and eventually evolve a corps of sufficient steadiness, ability, and experience to reduce to a minimum the trials heretofore experienced in such emergencies as at the beginning of the Spanish war. In time of peace the services of the corps would be utilized at the various military posts and depots, reducing by a good round sum the cost of services which must now be performed by civilian clerks, mechanics, packers, teamsters, laborers, etc., and furnishing a body of men skilled in the work of the Department, capable of being readily transferred to field duty to supervise, instruct, and direct the inexperienced additional force which would always be necessary.

CLERICAL FORCE.

Elsewhere in this report attention has been called to the insufficient clerical force now allotted this office. An increase is not requested in

the number of employees over the number allowed this office when I succeeded to it in April, 1903, but simply that the gradual, constant, and practical crippling be stopped and the numerical strength of the force be restored to what it was when I assumed charge of the office. During the past fiscal year the number of clerks in this office has been reduced by 16. When the annual report for the fiscal year ended June 30, 1902, was rendered there were 220 employees on duty here. At the date of this report there are 191 allotted to this office, and this decrease in help has been made despite the fact that there has been no perceptible decrease in the volume of work.

Under the provisions of the civil-service rules relating to transfers, during the past year other departments have applied for and obtained the transfer from this Office of a number of clerks—with hardly an exception the clerks selected for transfer being young men who, in addition to being competent general clerks, are skilled stenographers and typewriters, and who at the time of their respective transfers had been in the service just long enough to have familiarized themselves with departmental methods. However valuable the system of transfers may be to the departments drafting this class of employees, it is demoralizing to the department from which the clerks are drafted. It is true that the latter department can, under the rules, arbitrarily refuse to grant the requested transfer, but in every case the clerk whose transfer is asked is offered an increase in salary over that which he receives in the position from which transfer is sought, and in the majority of cases more rapid promotion than can be expected in the office in which he is serving is also promised.

When these facts are placed before the head of a department he approves the transfer rather than take the position of standing in the way of the material advancement of the clerk. Especially must this be true in an office like this one, where vacancies are left unfilled, thereby steadily decreasing the opportunities for promotion, and where the percentage of the higher grades is, it is believed, smaller than in any other office or department in Washington, with one exception. But even where approval is declined, the end in view, it would appear, can be gained at all events. In one case, giving first consideration to the interest of the proper administration of the office, approval of transfer to another department was refused, whereupon the clerk resigned and the next day was employed in the department which had sought and failed to secure his transfer. This was a case where the civil-service rules seemed to have unusual elasticity. After this occurrence I failed to see what could be gained for the office by refusing consent to requested transfers.

Instances have come to my attention where the department has been deprived of the services of clerks for considerable periods of time because of illness which, in some cases, has incapacitated the employees for a longer period than the combined ordinary and sick leave allowed within a year. Naturally, as employees grow older recovery from sickness progresses more slowly, and clerks who have served in the Department for a great many years without a day's sick leave become compelled to lose more than two months when overtaken by sickness. Where this has occurred the clerks affected have, by proper authority, been continued on the rolls, but, of course, without pay. At such times the office is deprived of its allotted clerical help, always to the detriment of business. It is recommended that authority be

given, by law if necessary, to temporarily employ clerks to fill vacancies existing when regular employees are absent from their duties for a longer period than sixty days in one year, this authority to be coupled with the proviso that such temporary employees shall be paid only from the funds appropriated or allotted for the position temporarily made vacant, the expense of clerical assistance in no case to exceed the sum regularly allowed the office.

I have always been, and am now, in favor of the adoption of some conservative and practicable plan looking to the retirement of superannuated employees of the Government. In the course of long years of service, in many cases covering periods equal to an average lifetime, employees naturally reach the higher grades, and when the course of nature asserts itself and the old employees can no longer render efficient services, younger clerks must assume the burden and responsibilities of carrying on the business of the office while the older ones stand in the way of giving them the compensation to which the nature of their duties entitles them. The head of a department very naturally hesitates to recommend the reduction of employees who have faithfully and efficiently given the best years of their lives to the Government's service and does not want to even consider the question of discharging them altogether.

This exceedingly difficult problem would be solved if there existed some system of retirement. It will not do to answer this by saying that in a long period of service the employees should have sufficient to provide a competence for old age. Government salaries and Washington living expenses are not conducive to affluence. I do not want to be understood as advocating any system of civil pensions. The employees themselves have formulated a plan under which the funds necessary to provide for retired pay would be supplied from their own salaries. As I am informed, much thought and study has been given to getting up the plan, and that its feasibility and practicability rest upon the scientific foundations of life-insurance endowment principles. It requires only the sanction of law to put it into effect. In the interests of the better and more efficient administration of department work, it would seem that this plan should at least be given a fair trial. If found not to work satisfactorily, the law authorizing it could be repealed as readily as enacted. Speaking of conditions in this Department alone, I am reluctantly compelled to say that unless some such solution is reached in the near future nothing will remain for this office to do but recommend the discharge of employees whose greatest fault is that they have grown too old to perform the work required.

With some exceptions, such as always exist where a number are employed, the clerical force of the Quartermaster-General's Office has during the past fiscal year rendered excellent service, and I am glad to acknowledge their ability and faithfulness. To the officers in charge of the various divisions of this office, and the majority of the clerks in their respective divisions, I am indebted for the untiring efforts which have made it possible to at least partially successfully meet the demands upon us.

Respectfully submitted.

C. F. HUMPHREY,
Quartermaster-General, U. S. Army.

The SECRETARY OF WAR.

REPORT OF THE COMMISSARY-GENERAL.

REPORT OF THE COMMISSARY-GENERAL.

WAR DEPARTMENT,
OFFICE OF THE COMMISSARY-GENERAL,
Washington, D. C., September 30, 1904.

SIR: I have the honor to submit the following report of the operations of the Subsistence Department for the fiscal year ending June 30, 1904:

RESOURCES, EXPENDITURES, AND BALANCES.

The following statement exhibits the aggregate fiscal resources and expenditures of the department and the balances at the close of the fiscal year 1904:

RESOURCES.

	Relief of citizens of the French West Indies, act approved May 18, 1902.	Subsid- ence of the Army, cer- tified claims.	Subsid- ence of the Army, 1901 and prior years.	Subsid- ence of the Army, 1902.	Subsid- ence of the Army, 1903.	Subsid- ence of the Army, 1904.
Amounts in Treasury to credit of appropriations of the Subsistence Department, June 30, 1903. Amounts which were reported in the annual report as being to credit of officers of Subsistence Department and of officers doing duty in that Department with the Treasurer, assistant Treasurers designated depositaries, and in their personal possession on June 30, 1903.	\$8,882.88			\$6,412,298.20	\$5,035,495.01	
Amounts refunded to the Treasury near close of fiscal year 1903, since carried to the credit of the appropriations.			\$5,034.20	92,249.68	1,110,410.75	
Amounts appropriated for subsistence of the Army for fiscal year ending June 30, 1904.				55,975.99	56,178.66	
Act of Mar. 2, 1903.						\$7,000,000.00
Deficiency act approved Feb. 18, 1904.		\$8,185.06				
Deficiency act approved Apr. 27, 1904.		883.88				
Amounts collected from various sources and refunded to appropriations of Subsistence Department, on the books of the Treasury during the fiscal year 1904.			13,306.32	13,970.82	56,022.51	65,646.80
Amounts charged against officers on account of funds alleged to have been lost by theft, etc., for which relief can only be obtained in the Court of Claims, under sections 1059 and 1062, Revised Statutes, or from Congress, as follows:						
Officers still in service.				2,964.91	710.59	
Amounts received by officers of Subsistence Department and by officers doing duty in that department from sales of stores during fiscal year 1904 and taken up for immediate disbursement.			181.58	1,871.15	17,377.77	2,482,605.43
Amounts taken up by officers doing duty in Subsistence Department on account of refund- ments and reclamations for stores lost, damaged, etc., in correction of errors in their accounts, etc., during above period.				455.99	1,062.98	10,629.59
Amounts taken up by officers as gains.					25.49	3,398.56
Amounts taken up by officers unexplained.				313.80	63	4,747.61
Total resources.	8,882.88	4,089.01	18,521.10	6,580,100.54	6,277,274.34	9,587,027.99

EXPENDITURES.

Amounts expended on the books of the Treasury from the appropriations of the Subsistence Department during the fiscal year 1904.....	\$4,416.44	\$4,089.01	.....	\$8,506.62	\$265,739.64	\$650.37
Amounts disbursed by officers of the Subsistence Department and officers doing duty in the Subsistence Department during the fiscal year 1904.....			\$182.72	1,281.10	73,351.72	8,280,240.83
Amounts dropped by officers doing duty in the Subsistence Department, in correction of errors in their accounts during the fiscal year 1904.....			2,453.70	81.00	120.67	859.26
Amounts of balances unaccounted for by officers whose accounts are in process of settlement. Amounts charged against officers on account of funds alleged to have been stolen, etc., now dropped from this statement as satisfied.....			2,579.36	496.58	29.74	.....
Unexpended balance of allotment transferred to general account of appropriation on books of War Department.....	4,416.44					.....
Amounts carried to the surplus fund on June 30, 1904 (act June 20, 1874).....			13,305.32	6,562,956.27		.....
Total expenditures.....	8,832.88	4,089.01	18,521.10	6,573,322.57	339,241.77	8,281,750.46

BALANCES.

Amounts in the Treasury to the credit of the appropriation of the Subsistence Department June 30, 1904.....					\$5,928,872.06	\$506,546.81
Amounts to the credit of officers of the Subsistence Department and of officers doing duty in the Subsistence Department with the Treasurer, assistant treasurers, designated depositaries, and in their personal possession, per the latest accounts received to June 30, 1904.....				\$4,308.64	2,779.51	778,270.58
Amounts charged against officers on account of funds alleged to have been lost by theft, etc., for which relief can only be obtained in the Court of Claims, under sections 1059 and 1062, Revised Statutes, or from Congress, as follows:						.....
Officers still in service.....				2,469.33	680.85	460.14
Officers out of service.....					5,700.15	.....
Total balances.....				6,777.97	5,938,082.57	1,285,277.53

In the foregoing expenditures for the fiscal year 1904 the following items of disbursements are included: Commutation of rations to cadets at the Military Academy, West Point, \$47,608.80; to enlisted men on furlough, \$54,835.40; to ordnance sergeants at posts not garrisoned, \$2,103.60; to enlisted men on duty where rations could not be issued conveniently, \$82,667.25; to enlisted men while traveling, \$46,555.83; to enlisted men in Army and Navy General Hospital, Hot Springs, Ark., \$11,046.40; commutation of fresh vegetables, \$1,862.35; meals for recruiting parties and recruits and troops moving, \$218,731.91; liquid coffee for troops traveling, \$20,996.43; salaries to civil employees of Subsistence Department at posts and stations, including wages of laborers and mechanics, fees of inspectors, and miscellaneous small employments, \$249,574.81; salaries of civil employees of Subsistence Department on transports, \$189,567.95; board wages of civil employees of Subsistence Department connected with the transport service while ashore, \$9,903.80; extra-duty pay, \$27,367.60; advertising, \$3,635.06; commercial newspapers, \$19.35; printing, \$2,473.31; rent of telephones, \$1,895.25; ice for issue to troops and for refrigerating purposes, \$92,692.07.

The following items of disbursements were made for the fiscal year 1903, but could not be included in the report for that year by reason of the delay in receiving the accounts at this office: Commutation of rations to cadets at the Military Academy, West Point, \$3,908.70; to enlisted men on furlough, \$5,490.15; to ordnance sergeants at posts not garrisoned, \$52.80; to enlisted men on duty where rations could not be issued conveniently, \$3,752.75; to enlisted men while traveling, \$187.50; to enlisted men in Army and Navy General Hospital, Hot Springs, Ark., \$1,097.20; meals for recruiting parties and recruits and troops moving, \$2,442.38; salaries to civil employees of Subsistence Department at posts and stations, including wages of laborers and machinists, fees of inspectors, and miscellaneous small employments, \$87.29; salaries of civil employees of Subsistence Department on transports, \$4,771.39; board wages of civil employees of Subsistence Department connected with the transport service while ashore, \$63.50; extra-duty pay, \$2.10; advertising, \$551.58; printing, \$209.75; rent of telephones, \$24.68; ice for issue to troops and for refrigerating purposes, \$5,400.38.

HOSPITAL ISSUES.

The supplies purchased and issued from stock on hand during the fiscal year for enlisted men in hospital, too sick to use the army ration, amounted in value to \$284,306.98.

Like issues were made in fiscal year 1903, amounting in value to \$1,089.32, but not included in said report owing to the delay in the receipt of the accounts and returns at this office.

Issues of articles differing from those of the ration to enlisted men in camp in the United States during periods of recovery from low conditions of health consequent upon service in unhealthy regions or in debilitating climates, aggregated in value \$1,237.99.

Like issues were made for fiscal year 1903, amounting in value to \$164.54, but not included in said report owing to the delay in the receipt of the accounts and returns at this office.

**VALUE OF STORES ISSUED AND TRANSFERRED TO OFFICERS AND
SAILORS OF THE NAVY IN FISCAL YEAR 1904.**

Subjoined is a statement of the value of subsistence stores issued to sailors and others, and transferred to officers of the United States Navy, and of amounts of same that have been paid for:

	Value.	Collected.
On the transport Kilpatrick	\$82.00	\$82.00
On the transport Sumner	6.51	1.38
On the transport Burnside	38.00	.....
On the transport Sherman	107.59	27.58
On the transport Sheridan	256.80	137.14
On the transport Logan	63.26	.....
On the U. S. S. Buffalo	18.84	18.84
Transfers to navy paymasters on island of Guam by sundry officers of the Army in July, 1903, to May, 1904	11,862.60	7,574.27
	12,429.10	7,841.21
Balance due and uncollected		4,587.90

A transfer has been reported as made to the navy paymaster on duty on island of Guam by the commissary at San Francisco, Cal., in June, 1904, but as the receipt of the officer receiving the stores has not yet come to hand a claim for the value of the stores has not yet been made on the Navy Department.

Claims have been made on the Navy Department for the value of the stores issued and transferred as above that have not yet been paid for.

**VALUE OF STORES TRANSFERRED TO OFFICERS OF THE NAVY IN FISCAL
YEAR 1903 AND NOT INCLUDED IN REPORT OF PRIOR YEAR.**

Transfers to Asst. Paymaster F. G. Pyne, U. S. Navy, in April, May, and June, 1903, at Guam, were made by Col. C. A. Woodruff, assistant commissary-general at San Francisco, Cal., which totaled in value \$7,346.95, and that amount was collected.

**VALUE OF STORES ISSUED AND TRANSFERRED TO OFFICERS AND
MARINES OF THE MARINE CORPS.**

Below is a statement of the value of subsistence stores issued to marines and transferred in bulk to officers of the Marine Corps, for issue to marines, and of amounts collected on account of same:

	Value.	Collected.
On transport Sheridan in October, 1903; January, February, and June, 1904..	\$1,312.76	\$1,186.25
On transport Thomas, July, October, and November, 1903	33.83	33.83
On transport Sherman in December, 1903; March and May, 1904	182.70	35.56
On transport Sumner in September and October, 1903	20.63	20.63
On transport Logan in December, 1903; January, February, May, and June, 1904	1,329.08	556.60
On transport Buford in March and April, 1904	5,725.06	.....
At Cavite, P. I., July, 1903, to June, 1904	64,605.79	46,342.96
At Isabela de Basilan, P. I., July, 1903, to February, 1904	1,829.55	1,799.44
At Pollok, P. I., July, 1903, to June, 1904	2,444.31	1,881.51
At San Juan, P. R., July, 1903, to June, 1904	8,092.05	6,508.18
At Honolulu, Hawaii, February, 1903, to June, 1904	1,801.19	638.50
At Guam, L. I., in July and August, 1903	27.79	27.79
	87,404.74	59,031.25
Balance due and uncollected		28,373.49

Claims have been made on the Navy Department for such of the above sums as are still due, most of which have been reported to the Auditor for the Navy Department for favorable action.

VALUE OF STORES TRANSFERRED TO OFFICERS AND MARINES OF THE MARINE CORPS IN FISCAL YEAR 1903.

The following is a statement of the value of subsistence stores transferred for use of marines in fiscal year 1903, the evidence of which was received too late to appear in the annual report of that year and of the amounts received in fiscal year 1904 in settlements made:

	Value.	Collected.
On transport Thomas		\$214.94
On transport Sheridan		2,220.75
On transport Sherman		7.50
Transferred to Pollok, P. I.		2,119.35
Transferred to Isabela de Basilan, P. I.		1,519.99
Transferred to Cavite, P. I.	\$31.60	14,700.23
Transferred to San Juan, P. R.		1,170.30
Total	31.60	21,963.06

The difference between the debit and credit items is due to the fact that the debit difference appeared in the annual report of the fiscal year 1903.

VALUE OF ISSUES TO INDIANS, CIVIL EMPLOYEES, ETC.

Value of issues to Indians.

Apache Indians at Fort Sill, Okla	\$9,471.75
Seminole-Negro Indian at Fort Clark, Tex	58.88
Indian prisoners (Chiricahua renegades)	50.47
Indians in Alaska (destitutes)	243.21

Value of issues to civil employees.

Civil employees of Quartermaster, Commissary, Ordnance, and Medical departments and the Signal Corps	\$280,199.09
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Value of miscellaneous issues.

Military prisoners at posts (general prisoners)	\$77,864.40
Destitute citizens	9.10
Citizens in quarantine at Fort Clark, Tex	11.94
Filipino insurgent prisoners, captured and in arrest	224.34
Destitute Filipinos	20.17
American prisoners at Bilibid prison, Manila, P. I.	651.56
Filipino military convicts at Bilibid prison, Manila, P. I.	1,034.75

VALUE OF STORES SUPPLIED VARIOUS PARTIES AND COLLECTIONS THEREFOR.

Below are a number of miscellaneous cases where stores were reported as supplied to various parties and amounts reported collected in connection therewith:

	Amount.	Collected.
To J. D. Sniffen, paymaster's clerk, in July and August, 1903.....	\$29.00	\$29.00
To Chas. E. Taylor, civilian prisoner, in July, 1903.....	12.50	12.50
To wrecking crew for U. S. transport Sumner, in July, 1903.....	28.84	28.83
To 31 native Philippine carpenters in August and September, 1903.....	39.60	39.60
To insular government, Philippine Islands, in September, 1903.....	11,814.85	11,814.85
To Philippine laborers and an interpreter in September, 1903.....	175.00	175.00
To Herman Bindenald, of Ordnance Department, in September, 1903.....	43.50	43.50
To Ralph W. Hartwell, of Ordnance Department, in September, October, and November, 1903.....	32.67	32.67
To Rev. P. H. Gardner, Catholic missionary, in September, 1903.....	24.00	.....
To Michael Meade and Clyde Gawthorpe, indigents placed on board the transport Sumner by United States consul, in November, 1903.....	10.50	.....
To W. E. Hess, witness for court-martial, December, 1903, to February, 1904..	60.00	60.00
To Mrs. H. A. Violland, wife of paymaster's clerk, in January, 1904.....	6.67	6.67
To Mrs. F. C. Peck, clerk in Ordnance Department, in March, 1904.....	29.00	29.00
To W. C. Atwater, clerk in Ordnance Department, in April, 1904.....	32.33	32.33
To C. L. Rice, clerk in Medical Department, in April, 1904.....	23.00	23.00
To Mark Bonners, teacher, insular employee, in April, 1904.....	27.00	27.00
To employees of insular government, officer's caretakers of animals, in April, 1904.....	31.33	31.33
To Philippine carpenters in April, 1904.....	304.50	304.50
To Medical Department, for disinfecting purposes, in April, 1904.....	2.64	2.64
To Medical Department, for malted milk, in June, 1904.....	126.36	16.20
To Porto Rican school-teachers and attendants on transport Sumner, in June, 1904.....	1,151.31	1,151.31
To quartermaster employees in November, 1903, and April, 1904.....	46.36	46.36
To quartermaster employees, July, 1903, to April, 1904.....	497.19	497.18
To Chas. Kock, cable seaman, Signal Corps, U. S. Army, in May, 1904.....	24.00	24.00
	14,567.15	14,422.47
Balance due and uncollected.....		144.68

Steps have been taken for the collection of the amounts for which payments have not yet been reported.

The following amounts of miscellaneous debits in reports of prior fiscal years have since been reported as paid:

On account of supplies furnished by Capt. H. P. Young, quartermaster and commissary, to wife of Private Charles Dusenbury, in March, 1903.....	\$40.50
On account of supplies furnished by Capt. J. de L. Lafitte, quartermaster and commissary, to sundry parties, in September, 1902.....	85.50
Total.....	126.00

ES OF SUBSISTENCE STORES.

The amounts received from sales of subsistence stores during the fiscal year are classified as follows:

	Subsistence of the Army.		
	1902.	1903.	1904.
To officers.....	\$701.60	\$2,525.66	\$669,091.34
To enlisted men, companies, detachments, and hospitals.....	324.56	9,143.49	1,080,400.65
To civilians.....	730.41	865.73	195,719.98
At auction.....	114.58	33.00	76,595.21
To Quartermaster's Department.....			3,192.27
To post exchange.....		1,581.06	138,473.21
To Indians.....			54.63
To Indian agents and employees.....			3,267.76
For meals on transports.....		3,228.83	141,864.97
To naval officers and enlisted men of Navy and Marine Corps.....			150,053.33
To post bakeries.....			70.49
To special sales.....			14,119.27
To court officers, Alaska.....			820.94
To United States Coast and Geodetic Survey.....			8,881.38
Total.....	1,871.15	17,377.77	2,482,605.43

The accounts containing reports of amounts received for sales of stores in the fiscal years 1902 and 1903 were not received in this Office in time to appear in the annual reports of those years.

SALES ON CREDIT.

Sales on credit to officers of the Army during the fiscal year ended June 30, 1904, as shown by the accounts of that year thus far received, amount to \$15,240.03, and sums thus far reported as collected through the Pay Department and otherwise settled amount to \$13,863.12, leaving the sum of \$1,376.91 yet to be collected.

Of the amount due from officers in the prior fiscal year, the sum of \$3,003.23 has been reported as collected.

The sales on credit to the enlisted men of the Army amount to \$22,553.02; the collections by the Pay Department on muster and pay rolls and on final statements on account of credit sales amount to \$18,437.03; leaving the sum of \$4,115.99 yet to be collected.

Collections on account of credit sales made in prior year amount to \$1,191.83, thus increasing the amount collected for that year in excess of the amount charged on that account to \$1,206.21, due presumably to a portion of the indebtedness reported in statement for fiscal year 1903 as still due on account of credit sales in fiscal year 1902 not having been collected until in the following year.

LOSSES.

Losses during the fiscal year were distributed as follows: In the Philippines, \$418,650.88; on transports, \$7,466.93; in the United States, Alaska, Porto Rico, and elsewhere, \$129,853.50. But from the total amount of such losses for the fiscal year is to be deducted the sum of \$85,980.59, derived from proceeds of sales at auction of damaged and deteriorated stores, and also for reclamations on contractors and others for cost of lost and damaged supplies.

Similar losses occurred in previous fiscal years and were found in delayed returns, and consequently could not be included in the annual reports of those years. They amounted to \$144.41 in the fiscal year 1900; \$11,548.95 in 1901; \$27,324.77 in 1902, and \$83,171.38 in 1903.

It is difficult and often impossible to prevent losses on perishable stores. In the case of fresh vegetables the losses have been large and are unavoidable; and this is true in a great measure of bacon and fresh beef and other delicate and perishable stores. Losses are due principally to long and difficult water and inland transportation and to trying climatic conditions, and not to any lack of care and effort to protect and preserve stores. The rapid abandonment of posts resulted in large losses. Stores were sent to inland stations, and then on sudden withdrawal of the garrisons the stores on hand were not fit to again stand the hardships of transportation and were sold, if there was a market, for very little. Those which were transported to the depot at Manila there became a loss. As an example of the abandonment of posts in the division, there were, on July 1, 1901, 554; on June 30, 1902, 201; on July 1, 1903, 113, and on June 30, 1904, 99.

POST COMMISSARY-SERGEANTS.

The number of post commissary-sergeants in the service at the beginning of the year was 204. During the period of this report 9 were appointed, 4 were discharged, 8 retired, 2 died, and 1 deserted, leaving 198 in the service at the end of the fiscal year 1904.

CLAIMS.

The number of claims on hand, received, and disposed of during the fiscal year ending June 30, 1904, were as follows:

	Claims for commutation of rations.		
	While held as prisoners of war in rebel States, and in the Philip-pines.	While on furlough and miscellaneous claims.	Total.
On hand June 30, 1903.....			
Received during fiscal year 1904.....	192	235	427
Total.....	192	235	427
Disposed of during year.....	192	232	424
On hand June 30, 1904.....		3	3

The number of letters and indorsements written during the year in connection with the above claims was 461.

ACCOUNTS AND RETURNS.

The following is a statement of accounts current and returns of subsistence stores and property on hand June 30, 1903, received and examined during the fiscal year ended June 30, 1904, and on hand at the close of that fiscal year awaiting examination:

	Accounts current.	Returns of stores.	Returns of property.	Total.
On hand June 30, 1903.....	150	205	107	462
Received during fiscal year 1904.....	4,357	2,997	1,304	8,658
Total.....	4,507	3,202	1,411	9,120
Examined during fiscal year.....	4,481	3,128	1,403	9,012
On hand June 30, 1904.....	26	74	8	108

The examination of the accounts required the verification of 105,352 vouchers; the returns of stores, 61,593 vouchers, and the returns of property, 3,976 vouchers. In connection with the examination 6,353 postal cards were used, 7,499 letters and 5,824 indorsements written and recorded, 5,655 papers copied, and 404 days of time on work not classified consumed.

CONTRACTS.

Contracts to the number of 434 were made for subsistence supplies and 538 for meals for recruits and recruiting parties, making a total of 972 contracts acted on and disposed of during the fiscal year.

CERTIFICATES OF SERVICE AND NONINDEBTEDNESS.

Certificates of service as acting commissary were issued to the number of 525 and certificates of nonindebtedness to the number of 1,023.

CLERICAL FORCE.

The clerical force of this Office is efficient and deserving. It has been steadily reduced for over three years, and at the close of the year it was necessary to discharge 2 clerks and transfer 2 clerks to meet a cut in the allotment to this office for the temporary force. Even with the extension of the extra half hour to the official day and diligent effort on the part of every clerk, many of whom labored before and after office hours to keep up their work, the present force is not equal to demands upon it. The practice of working overtime and the continual labor under pressure are not good for the work or the worker, and is a hardship upon those who thus willingly strive to do what in all fairness a larger force is necessary to carry on. In addition to what is required for the regular establishment, a great amount of labor has been entailed upon this Office on account of the militia, in the way of requisitions, estimates, letters, indorsements, examinations of accounts and returns, records, etc., which has been all the more difficult because of the lack of experience on the part of the militia. Every division of this Office is affected by it, and the work increased at least 15 per cent. In consideration of the foregoing reasons I earnestly request that 8 additional clerks be provided for this Office.

SUBSISTENCE FUNDS HELD IN HAND FOR READY DISBURSEMENT.

I again urgently recommend the passage of a bill by Congress to give authority to all officers intrusted with the disbursement of subsistence funds to hold restricted amounts of such funds in their personal possession. The exigencies of the public service require an open disregard of the restrictions of the existing law in cities where the treasurer or an assistant treasurer is located.

A bill which was intended to meet the necessities of the case passed the Senate March 24, 1900 (S. 2870), a copy of which is appended:

AN ACT concerning disbursing officers of the Subsistence Department of the Army.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That officers intrusted with the disbursement of funds for the subsistence of the Army are hereby authorized to keep, at their own risk, in their personal possession for disbursement, such restricted amounts of subsistence funds for facilitating payments of small amounts to public creditors as shall from time to time be authorized by the Secretary of War.

AUTHORITY FOR DISPOSITION OF SUBSISTENCE STORES NO LONGER REQUIRED.

I have the honor to again urge upon the Secretary of War the need of legislation authorizing the sale at public auction of subsistence stores in good condition which may at any time accumulate in excess at any depot or point of supply and which can not advantageously or economically be transported to other points for issue or sale to troops. The draft of a bill to accomplish the object desired, heretofore submitted by this Office, is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War may cause to be sold at public sale, under regulations to be prescribed by him, such subsistence stores in good condition, intended for issue or for sales to officers and enlisted men, as may from time to time accumulate at any subsistence depot, military post, or in the field, in excess of amounts required for use and which can not, with economy and advantage, be shipped to other subsistence depots, posts, or places for military use, the proceeds to be immediately available for general disbursement, under the appropriation for subsistence of the Army current at the time of sale for any of the objects contemplated by that appropriation.

As the proceeds of all sales of subsistence supplies are, by the act of March 3, 1875 (18 Stat. L., 410), now "exempt from being covered into the Treasury" and are made "immediately available for the purchase of fresh supplies," the above proposed legislation is in exact accord with existing law as to disposition of proceeds of authorized sales of subsistence supplies. There is no law, however, authorizing the sale to the public of subsistence supplies in bulk which are in good condition, the only legislation bearing on the subject of sales of military supplies (sec. 1236, Rev. Stat.) being general in its nature and providing only for the sale of stores which, upon proper inspection or survey, appear to be "damaged" or "unsuitable for the public service." As all public sales of subsistence supplies in good condition in bulk now taking place are being made under the guise of the stores being "unsuitable," and such an appropriation of the wording of section 1236 to cover transactions which would else be without even the color of authority of law is strained and unsatisfactory, I earnestly recommend that the above draft of law be pressed upon the attention of Congress.

ARMY BAKERS.

I renew the recommendation that has been made in eighteen annual reports by Commissaries-General since 1877 for the enlistment of bakers in the service.

The position of baker at a post is an important one. The bread ration is at all times a most essential element of the soldier's fare, and its quality has much to do with satisfactory subsistence of the troops. If bread is indifferently baked it causes widespread complaint, and often militates unjustly against the Subsistence Department.

In connection with the subject of bakers, the subjoined extract is from a report of Capt. Alexander M. Davis, commissary, United States Army, depot commissary of the provisional division, dated Fort Riley,

Kans., November 7, 1903, to the chief commissary, provisional division, Fort Riley:

I also recommend that provision be made in regulations for adequate extra pay for bakers when baking for commands larger than the ordinary post. The pay provided in paragraph 333 (?), Army Regulations, makes no difference between a four-company post and a division. A baker capable of laying out the work in conducting a bake shop such as was operated at this post during the maneuvers should receive double the pay provided. The chief assistants also, under such conditions, have responsibilities on their shoulders that demand more pay than given to the man that wheels the bread trough or molds the loaves. There is no provision for such increased pay. I recommend where baking is done by enlisted men for commands of over 2,000 strength and less than 5,000, the authorized number of chief bakers and assistants and their pay be as follows: One chief baker, at \$1 per day; 1 assistant chief, at 75 cents per day; 1 chief of shift for each eight-hour shift, at 50 cents per day; bakers each, at 35 cents per day; for commands of over 5,000 men, 1 superintendent, at \$1.50 per day; 2 chief bakers (1 day and 1 night chief), at \$1 each per day; chiefs of shift and bakers as above.

Touching the foregoing the following is the expression of opinion of Lieut. Col. A. L. Smith, deputy commissary-general, chief commissary of the provisional division, dated Fort Riley, Kans., November 17, 1903, to the commanding general, provisional division:

I concur in the recommendation of the depot commissary that better pay be provided for bakers in large camps. The Army Regulations on this subject evidently contemplate ordinary sized posts, and the pay therein authorized is insufficient for the work and responsibility where large bodies of troops are assembled.

Paragraph 337, Army Regulations, as amended by General Orders, No. 8, Adjutant-General's Office, 1903, does not, in my opinion, furnish adequate remuneration for the services of bakers employed in large camps where the work and responsibility are great, and which conditions were hardly contemplated, it is believed, when present regulations were framed. If bakers are not to be enlisted I concur in the recommendation for an increase in their pay along the lines suggested by Captain Davis and recommended by Colonel Smith.

MILITIA.

1. GENERAL REMARKS.

The Subsistence Department is only slightly involved with conditions which arise under section 14 of the act of January 21, 1903, except the feature of accountability. It is only measurably affected by the conditions arising under section 17 of that act in the way of making issues (for which the Subsistence Department is to be reimbursed) or making sales to the militia for cash. But the department is largely affected by section 15 of the act, which provides for joint maneuvers of the regulars and the militia.

When the organized militia are engaged in joint maneuvers with the Regular Army, as contemplated in section 15 of the act, they should be treated as nearly as practicable as regular troops. If this can not be done, or such assimilation is contrary to the law or the intention of Congress, then it is recommended that the necessary legislation be secured to effect this result. If it can be brought about it will be of advantage in teaching in time of peace what must be practiced in time of war. It will also save manual labor and needless multiplicity of clerical work, go far toward insuring successful administration, and be decidedly in the interest of economy.

2. JOINT MANEUVERS.

In connection with the subject of joint maneuvers of the regulars and militia, the following extract is from the report of Col. F. E. Nye, assistant commissary-general, Chief Commissary, Department of the Lakes, Chicago, Ill.:

The organized militia participating in the maneuvers at Camp Young, Ky., in September and October, 1903, were supplied with travel rations, except coffee and sugar, by shipments to the company commanders by the purchasing commissary in this city under directions of this office. Each officer to whom rations were shipped was instructed as follows:

"Maj. A. D. Kniskern, commissary, purchasing commissary, this city, has been requested to ship you travel rations for your command en route to West Point, Ky. In issuing these rations your attention is invited to inclosed 'memorandum' showing the quantity of each component. You will purchase liquid coffee for troops en route not to exceed 21 cents per man per day, forwarding properly receipted vouchers in duplicate to this office, through the depot commissary, West Point, Ky., for payment. Blanks for such purpose inclosed. Fill out the line for each purchase, have it receipted by party furnishing the coffee, and, on arrival at West Point, forward as directed above."

The "memorandum" referred to in this letter was:

[Memorandum.]

"Travel rations for your company will be invoiced to your regimental commissary, but invoices will be mailed and shipment made to you. Upon arrival at West Point turn over invoices and all surplus articles of the ration to your regimental commissary, together with a ration return covering all issues made by you, taking, for your own protection, the memorandum receipt of regimental commissary for all articles turned in. The regimental commissary should sign and mail receipts to invoicing officer for all stores shipped to and received by you and account for same on his return, covering all issues by ration return, turning in surplus to depot commissary at West Point, Capt. H. E. Wilkins, taking his receipt therefor, and thus balancing his papers. If stores received by you do not correspond in articles and quantities with invoice, make a certificate showing the facts of the case as to articles and quantities actually received and deliver same to regimental commissary when you turn over your invoices.

"Travel rations.

Hard bread.....	100 pounds per 100 rations.
Corned beef	75 pounds per 100 rations.
Baked beans.....	25 pounds per 100 rations.
Canned tomatoes.....	50 pounds per 100 rations.

"The unit of issue is a full day's ration. A shortage in the unconsumed travel-ration articles turned in for the day of arrival may be disregarded if it does not exceed one-half a ration per man per day; if it exceeds that amount investigation will be made and the money value of the shortage charged against the pay of those who are responsible." (Subsistence Manual, 775.)

This Office was kept admirably informed by the adjutant-general of the department of all matter affecting it regarding the militia, and calls for shipment were made to the organizations as soon as it was practicable to do so, as it was recognized that it would take quick work on the part of the purchasing commissary and shipping quartermaster to get the rations to the organizations in time to be available, since much would necessarily go as weigh freight, and in order to protect the officers of the organizations the information as to quantity of each component of the ration and instructions as to turning in surplus to depot commissary, maneuver camp, were embodied in "memorandum" heretofore quoted. The result of this action was that (so far as this Office is informed) the militia were amply supplied with travel rations and obtained without difficulty the liquid coffee required.

The rendering of proper returns in accordance with regulations, and forwarding properly prepared vouchers for the coffee purchased was not, however, done as it should have been under instructions given. * * * A letter received from the depot commissary at Camp Young also showed that some of the organizations on arrival at camp drew full field rations for time for which they had already been subsisted on travel rations.

The fact is recognized that nearly, if not all, of this arose from a lack of technical knowledge on the part of the militia officers. It is referred to now as showing, in my opinion, the necessity for more practical training of regimental commissaries and the regimental commissary sergeants of the organized militia. Admitting the advisability of such training, the question presented is how it can be obtained. At the last maneuvers lectures on subsisting troops were given at the camp. The value of such lectures is admitted, but it is not believed that it goes deep enough into the matter, or that an officer can learn these important duties in a theoretical manner so as to be of any great value to him in performing the duties and rendering the necessary papers covering his accountability.

It is therefore suggested that it would be of the greatest value if an experienced post commissary-sergeant of the United States Army could be detailed with each regimental organization of the organized militia immediately preceding future encampments to accompany that organization to camp and back, remaining with them until all accountability had been covered by proper returns and accounts. *Not to do the work* but to show when and how it should be done. A living encyclopedia for reference and instruction of the regimental commissary and the regimental commissary sergeant. It is believed that practical instruction, given, as it would be, under conditions impressing it upon the minds of the subsistence officer of the organization and his noncommissioned assistant, would be of more value and would be longer remembered than instructions given in any other manner. These instructions would cover preparation of requisitions for travel rations, estimates for coffee money, the receiving, issuing, and accounting for the rations, and the disbursing and accounting for the money; and on arrival at camp, of preparation and filing of proper ration returns, including the utilization of company savings. It will be seen that after having been taught these important matters by practical instruction at the maneuvers the organization would, in case of mobilization for actual hostilities, be in shape to handle the matter of its subsistence quickly and correctly, greatly to the advantage of both the organization and the Government. It is thought that these commissary-sergeants could largely be obtained from posts whose garrisons were participating in the maneuvers.

This is first rate and not dissented from in the least; but I would supplement it by requiring the militia commissary and commissary-sergeant to go to a United States post and remain on duty there for a month. In this way they will pick up a practicable knowledge of the business and be more at home in their work when they take the field.

3. COST OF JOINT MANEUVERS.

The following is the cost, so far as returns yet received indicate, of issues and expenditures made during the fiscal year on account of the organized militia engaged in joint maneuvers with the regulars, under the provisions of section 15 of the act of January 21, 1903:

Issues of rations.....	\$24, 637. 08
Liquid coffee.....	1, 436. 90
Commutation of rations to troops stationed where rations could not be conveniently issued.....	171. 75
Total.....	26, 245. 73

4. DISTRICT OF COLUMBIA MILITIA.

The militia of the District of Columbia were supplied in July, under the provisions of the act of March 1, 1889, and by direction of the Secretary of War, rations to the value of \$2,456.47. It is the opinion of this office that the expenses of the regular encampment of the entire organized militia of the country are fully provided for under the act of January 21, 1903. The act itself embodies an extensive scheme to promote the efficiency of the organized militia of the States, Territories, and District of Columbia, and it is believed that Congress intended to place the militia of the whole country on the same basis,

and not to make an exception in favor of that of the District of Columbia by which it may share the benefits of two appropriations for identically the same thing, as it would practically do if allowed the benefits arising under the act of March 1, 1889 (25 Stat. L., 780), and the act of January 21, 1903, which enlarged the application of the act of June 6, 1900 (31 Stat. L., 662; 32 Stat. L., 775).

MANEUVERS AT WEST POINT, KY.

The maneuvers which were held at the above-mentioned place began on September 25, and continued until October 16, 1903. The following is a copy of the report submitted under date of October 17, 1903, by Capt. H. E. Wilkins, commissary, chief commissary maneuver division, to the adjutant-general of the maneuver division, in connection with the maneuvers:

Pursuant to Special Orders, No. 6, War Department, Washington, August 21, 1903, I proceeded, by way of West Point, Ky., to obtain information relative to supply of subsistence stores to be obtained in that vicinity, to Chicago. Upon arriving at Chicago I reported to the commanding general Department of the Lakes, for instructions; after which I returned to Washington by way of West Point, and while at the latter place made arrangements for opening proposals for the perishable articles of the ration. Circular proposals were sent out to be opened at West Point, Ky., on September 16, 1903.

Under Special Orders, No. 14, War Department, Washington, August 31, 1903, I, on September 12, 1903, proceeded to West Point, Ky., and reported by letter to the commanding general of the maneuver division for duty as chief commissary on his staff, and also assumed the duties of depot commissary at the camp. Capt. H. G. Cole, who reported to me under Special Orders, No. 14, War Department, Washington, August 31, 1903, was placed in charge of the general mess which was to be established for the commanding general and staff, umpires, and visiting officers.

Bids for the supplies were opened on September 16, 1903, and the following prices were obtained: Beef, 5.97 cents per pound; bread, 2.08 cents per pound; potatoes, 1.1 cents per pound; onions, 1.2 cents per pound; ice, 0.275 cent per pound.

It was decided to supply the bread by contract rather than to attempt, with the limited facilities at hand, the baking of bread in the camp for so large a command. The result was entirely satisfactory.

The articles of the ration purchased at West Point gave excellent satisfaction, and, with the exception of one small lot of potatoes hurriedly supplied, there was no complaint. The other articles of the ration and most of the sales stores were supplied by the purchasing commissary at Chicago, Ill., and were uniformly excellent. Rations were issued to regiments on consolidated ration returns, so that the depot commissary at the camp was the only officer who was compelled to make returns. Fresh beef, bread, and ice were issued daily from cars on sidetrack adjacent to commissary storehouse. This plan worked well except on the days of arrival and departure of troops, when, there not being sufficient room on the sidetracks, it was necessary to place the cars about a mile distant. This trouble could be obviated in the future by having a spur track out of the way of other traffic of sufficient capacity to hold cars for the subsistence department.

In accordance with orders the regular troops arriving at the camp had been rationed to include September 30, except beef, bread, vegetables, and ice, which from September 26 were supplied by the depot commissary. On the 30th of September rations were issued to the regular troops for a period of twelve days to carry them beyond the time of departure of the militia organizations, and on the 12th of October the regular troops were rationed up to and including the 16th, the end of the camp.

The organized militia began arriving October 1, and were rationed for two periods of five days each. This was done to anticipate a period of famine which might have resulted had the entire ten days' rations been issued to the militia organizations in the first instance. It was my intention and suggestion to the regimental commissaries of the organized militia, that they issue rations to their companies daily. This, in most instances, was done, but some issued rations to their organizations for

the entire period, with the result that at the end of the fourth day some companies were out of rations. While the plan of daily issues by the regimental commissaries of the organized militia entails additional work upon them, it is my opinion that it is the only method which will insure every company having rations on hand for the last day's consumption.

It appears that under section 15 of the act of January 21, 1903, there is no provision made for the transfer of funds to any officer of the organized militia. This omission caused some little difficulty in the matter of the transfer of funds for the purchase of liquid coffee (a portion of the travel ration) for the militia troops en route to and from the camp. The ordinary methods followed in the case of similar movements of regular troops could not be used. It resulted in the captains of the companies being compelled to advance their own funds for coffee, and to seek reimbursement later from the subsistence department. These accounts are in the process of adjustment, and no loss will result to the company commanders, but the resulting inconvenience is obvious.

The expense incurred by the Subsistence Department at this camp is as follows:

Subsistence of foreign attachés.....	\$52. 50
Rations issued to regulars.....	8, 435. 02
Rations issued under 40 cents fund, regulars.....	43. 71
Commutation of rations, regulars.....	253. 77
Pay-roll clerk.....	139. 99
Pay-roll laborers.....	313. 50
Total, regulars.....	\$9, 238. 49
Rations issued to militia.....	11, 489. 15
Rations issued under 40 cents fund to militia.....	14. 76
Total, militia.....	11, 503. 91
Grand total.....	20, 742. 40

In addition to the above there will be payments made for liquid coffee for militia companies en route to their respective stations. These accounts are in the process of adjustment, and will approximate \$1,428.

The extra expense incurred by the Subsistence Department due to this camp, in addition to the value of rations issued to the militia, is the amount paid to laborers (\$313.50) and for subsistence of foreign attachés (\$52.50), \$366.^a

In the forenoon of October 2 the chief commissary gave a short talk to the commissary officers of the organized militia on the subject of the administration of the Subsistence Department, embracing therein such instruction as was thought necessary for the camp. A brief discussion followed. At night, October 2, Maj. A. D. Kniskern, commissary, purchasing commissary, Chicago, Ill., gave an entertaining and instructive lecture to all officers on "The subsistence of armies."

Much time and attention was devoted to the officers' mess by Capt. H. G. Cole, the assistant to the chief commissary, with results that were generally satisfactory. The table and kitchen ware, stoves and tinware were supplied by the Quartermaster's Department. The mess was run by a caterer who furnished meals for a fixed price, on a cash basis. The balance sheet for this mess showed that the disbursements exceeded the receipts by about 25 per cent. I am not prepared to recommend that the Subsistence Department be charged with the duty of running an officers' mess.

Many thanks are due to Captain Cole for his active and able assistance. I also take great pleasure in commending Commissary Sergeants Louis V. DeBirny, John J. O'Keefe, and Charles Karsten for their untiring efforts and their intelligent, active assistance in furthering the work of the Department. They worked absolutely without hours, and the results they obtained could not be improved upon.

Quantities of subsistence stores sold at Camp Young, Westpoint, Ky., during the maneuvers in September and October, 1903.

Apricots, 39 cans; bacon, breakfast, 177 pounds; basins, hand, 25; beef, chipped, 144 cans; borax, powdered, 2 pounds; brushes, tooth, assorted, 9; cheese, American, 199 pounds; cheese, Edam, 3; chocolate, plain, 9 pounds; chocolate, vanilla, 11 pounds; cigars, J. S. Plantation, 1,700; cigars, Mercantile, 1,150; cinnamon, ground, 24 pounds; cloves, ground, 1 pound; cocoa, breakfast, 8 pounds; corn, green, 288 cans; crabs, 3 cans; crackers, ginger, 120 pounds; crackers, soda, 120 pounds; crackers,

^aNot assessed against the Subsistence Department.

Graham, 41 pounds; envelopes, letter, 400; extract of clams, 2 cans; flavoring extract, lemon, 21 bottles; flavoring extract, vanilla, 7 bottles; ham, deviled, 48 cans; ham, sugar-cured, 497 pounds; ink, black, 14 bottles; jelly, currant, 30 cans; lard, 84 cans; macaroni, 175 pounds; milk, condensed, 288 cans; milk, evaporated, 960 cans; molasses, 4 cans; mustard, French, 12 bottles; mustard, ground, 4½ pounds; oil, olive, 8 bottles; olives, 24 bottles; oysters, 48 cans; paper, letter, 4 quires; peaches, 192 cans; pears, 48 cans; pease, American, 223 cans; pickles, mixed, 45 jars; pine-apples, 46 cans; polish, shoe, black, 12 cartons; polish, shoe, russet, 87 packages; preserves, damson, 12 cans; salt, table, boxes, 56 pounds; sardines, 50 boxes; sauce, tomato, 53 bottles; sauce, Worcestershire, 15 bottles; sausage, pork, 7 cans; shoe strings, linen, 90 pairs; shrimp, 1 can; sirup, cane, 3 gallons; sirup, maple, 21 gallons; soap, Ivory, 25 cakes; soap, sapolio, 28 cakes; soap, glycerin, 28 cakes; soap, Amole, 25 cakes; soup, chicken, 19 cans; soup, clam chowder, 25 cans; soup, mock turtle, 8 cans; starch, corn, 20 pounds; sugar, cut loaf, 219 pounds; sugar, granulated, 830 pounds; tapioca, 27 pounds; tobacco, plug, 44 pounds; tobacco, smoking, granulated, 49 pounds; tongue, beef, 5 cans; towels, bath, cotton, 8; towels, huckaback, 17; toweling, unbleached, 40 yards; tooth powder, 10 bottles.

MANEUVERS AT FORT RILEY, KANS.

The maneuvers at the above-named place were held during the month of October, 1903. Below is a copy of the report, dated November 7, 1903, of Lieut. Col. A. L. Smith, deputy commissary-general, who was chief commissary of the provisional division; also a copy of the report, dated November 7, 1903, of Capt. A. M. Davis, commissary, depot commissary at Camp William Cary Sanger, Fort Riley, Kans., relating to the maneuvers.

Colonel Smith's report follows:

On September 25, with the understanding that I was to be detailed as chief commissary, provisional division, I proceeded to Kansas City, Mo., where I met, by appointment, Major Bean and Captains Davis, Elliott, and Grove, of the Subsistence Department, and arranged with them for the subsistence of troops that would be assembled at Fort Riley for the maneuvers. On October 2 I reported in person to Major-General Bates, at my own expense, for any special instructions that he might have, and in conformity therewith reported in writing to Maj. E. J. McClelland, as chief of staff on October 5 and in person at Fort Riley on October 13. * * *

On my arrival at Fort Riley I found that Maj. W. H. Bean had already been assigned to duty in charge of the headquarters mess and Capt. A. M. Davis to duty as depot commissary. Capt. William Elliott, commissary, was assigned to duty as chief commissary of the Third Brigade, which was composed of three National Guard regiments, and Captain Cook was assigned to duty as chief commissary of the cavalry brigade, and also to duty as assistant to Major Bean in the general headquarters mess. He personally conducted the mess from October 22 to 27 while Major Bean was absent on leave.

The stores from the post of Fort Riley were utilized for the provisional division, and the report of Capt. A. M. Davis, herewith inclosed, shows the quantity issued and sold. Most of these stores were on hand at Fort Riley on my assuming the duty, and but few stores were ordered in afterwards by freight, when the daily report showed there was going to be a shortage. Thanks to the arrangement made by the chief commissary, Department of the Missouri, not a single item had to be shipped in by express.

Issues to the 7,000 regulars were made in the usual and satisfactory manner. Of course all National Guard regiments had received more rations for the travel from their home stations to Fort Riley than they were entitled to, because, as may always be expected, none of their companies had their full strength when they started, as many enlisted men always fail to report for duty at the last moment. As their surplus articles are never fit to issue to other regiments, each regimental commissary was directed to care for the surplus articles of the travel ration, under the supervision of the chief commissary of the brigade, until after the encampment, and for their journey back to their home stations to draw only enough of the various articles to complete, with what they had on hand, travel rations for the length of time which was estimated by the Quartermaster's and Pay Departments it would take the various organizations to reach home. As the various National Guard companies of the provisional regiments were made up of detachments from all the organizations in their

though received, addressed to him, in the refrigerator cars with the issue beef. The total quantity of contract beef issued and sold during the encampment was 145,524 pounds, which differed but 16 pounds from the shipping vouchers of Armour Packing Company, to my mind a remarkable showing.

The bread furnished was baked in the post bakery under the direct supervision of the depot commissary, who was also post treasurer. The bakery is a new structure, thoroughly equipped with modern apparatus for turning out bread. A dough mixer of 3-barrel capacity and two ovens, each capable of holding twenty-eight 25-inch pans, did the work. When it was expected that the maneuver division would number 15,000 troops additional, oven room was provided for by putting up eight Blodgett ovens in a shed adjoining the bakery. These were coupled together and the pipes led into one large steel stack, which is believed to have been part, at least, of the reason for their failure. Every known method was resorted to to make good bread in these ovens without success, and they were abandoned, dependence being put in the two brick ovens alone. There were employed in the bakehouse 26 men, organized in three shifts of eight hours each, with two head bakers as supervisors, each working twelve hours. Each regiment participating in the maneuvers furnished its quota of bakers, except those of the National Guard. They proved an excellent lot of men, did good service, and whatever success attended the bakery work is due to the men employed, and especially to Private Thomas H. Parsell, Seventh Battery, Field Artillery, the head baker, who labored early and late to achieve results. The bread was excellent in quality, and nine-tenths of the flour ration was found to give all that the troops would eat. The other one-tenth was given in hard bread for lunches during all-day maneuvers, or flour, according to desire. The total quantity of bread issued was 142,113 rations; quantity sold, 3,850. The greatest quantity of bread turned out of the two brick ovens during one period of twenty-four hours was 9,000 rations. The greatest quantity turned out by the Blodgett ovens and the two brick ovens combined was 10,800 rations. Total rations issued, sold, and exchanged for flour from October 11 to 31, 1903, 147,776. The total expense of the bakery, exclusive of fuel, was \$351.79. The proceeds of sales and savings amounted to \$927.64, leaving to be disbursed to organizations participating \$575.85, which for troops from other posts was sent in lump sum to the commissary of the regiment or battalion and in case of the Hospital Corps to the chief surgeon, provisional division, to be by them distributed to the several units of their organizations.

The total number of rations issued by the depot commissary during October was 187,659.

COST OF SUBSISTENCE FOR THE NATIONAL GUARD.

The cost of subsistence for the National Guard from the date of arrival in camp until returned to home stations was, exclusive of coffee furnished on coffee tickets, as follows: * * * \$5,819.33.

The value of coffee tickets furnished national guard troops on return journey will have to be ascertained from the chief commissary, Department of the Missouri, after settlement has been made.

SALES STORES.

The sales stores was opened from 9 a. m. to 12 m. and from 1 to 4 p. m. The sales slips, form 54, were serially numbered and entry made in cash book of number of slip and amount of cash only; a stock book was kept in which entries were also made by slip numbers. This system was found to work well, and the record checked closely with the inventory made each day at the close of business. Total value of the stores sold on the abstract of sales during the month of October was \$5,543.07. An itemized list of sales stores sold in camp from the date of opening on October 14, 1903, until the close, on the 31st, is hereto appended, marked "F." It gives a fair idea of the requirements of about 9,000 troops, seventeen days.

GENERAL.

A daily abstract made from vouchers showing received, issued, and sold, and remaining on hand was kept in each warehouse. In warehouse No. 2, including the sales store, this record was checked by the stock book and the daily inventory, and was found to be accurate. From this a daily report was made to the chief commissary, showing the stores on hand at the close of business the preceding day. A circular, addressed to regimental commissaries, requesting them to assist the depot commissary by having all orders for officers' messes and, as far as possible, orders for stores desired by the men consolidated and the purchase made in bulk by the

regimental commissary sergeant, to be later distributed by him. This request was well responded to by some regiments, and materially reduced the number of individual purchases at the sales store.

FORCE.

The force of the depot commissary consisted of 1 captain commissary, U. S. Army; 1 assistant; 4 commissary sergeants; 1 civilian clerk, Subsistence Department; 1 regimental commissary sergeant; 4 enlisted men, and 10 civilian laborers, one of whom was a messenger at the office of the chief commissary and one a night watchman at warehouse No. 2. It is but due to state that whatever of success was achieved by the depot commissary was due in major portion to the excellent work of Second Lieut. J. P. Barney, squadron quartermaster and commissary Fourth Cavalry; Mr. C. S. West, clerk, Subsistence Department; Post Commissary Sergts. Joseph Zeising, A. G. Wood, Clarence S. Gould, and Lewis R. Taft, and Regimental Commissary Sergt. Frank J. Donhoe, Fourth Cavalry, all of whom labored faithfully and intelligently. To them my thanks are heartily extended.

RECOMMENDATIONS.

Should this place be determined upon as a permanent maneuver ground for large bodies of troops, a permanent building of corrugated iron roof and sides on substantial timber frame should be constructed on a site selected for the camp for use of the depot commissary. Should no building be erected for this purpose, I would recommend that next year the depot be retained in the post commissary building and only a sales store operated in camp.

I would also recommend for large encampments of this nature the distinctive symbol of the Subsistence Department be embodied in a suitable flag, to be flown above the commissary storehouse as a guide to those seeking it. With a large number of troops coming into a new camp, one of the first places sought is the depot commissary. A flag consisting of the red crescent on a white ground would need no explanation to any officer who had ever seen a box of subsistence stores. Regarding the post bakery I would recommend that the third oven for which the foundation is already laid be immediately constructed so as to be available next year. I also recommend that provision be made in regulations for adequate extra pay for bakers when baking for commands larger than the ordinary posts. * * *

I desire to express my obligation to the officers of the Quartermaster's Department for immediate and cordial response to every request made upon them. These officers were Capt. C. B. Baker, quartermaster, U. S. Army, chief and depot quartermaster, provisional division, and First Lieut. Gilbert C. Smith, Second Cavalry, assistant.

I desire to express the obligation of this office for the assistance rendered and the courtesies extended by the chief commissary, provisional division, and the chief commissary, Department of the Missouri. * * *

EXHIBIT B.

1. The following regulations and instructions for the performance of work in this office are published for the information and guidance of all concerned:

ORGANIZATION.

2. The plant of the depot commissary will consist of the main office (in post), the camp office, warehouse No. 1 (in post), warehouse No. 2 (in camp). The sales store and the fresh beef and bread cars on the spur near warehouse No. 2.

TRANSFER OF STORES.

3. Transfers of stores from one warehouse to another will be made only on written orders of the depot commissary or his assistant.

4. Transfers of stores or property between any two warehouses will be made on shipping bills in triplicate. All three bills will be receipted by the delivery man, whether driver of wagon or conductor of car. One copy to go by him to consignee, who will receipt on bill and return same to consignor. The second copy will go direct to consignee as his voucher. The third copy will go to the abstract clerk in the office from which shipment is made. First and second copies will have noted on them the hours of shipment and receipt.

5. A daily abstract of receipts and shipments will be kept in each warehouse. For this purpose a return of stores will be used. One line per day on upper half for receipts and one line per day on lower half for shipments. A small red ink figure

over each quantity entered will show the number of the voucher, which will be numbered to correspond. No warehouse will refuse to receive stores from another warehouse of the depot, no matter at what hour they arrive, except in case of fresh bread received at warehouse No. 2, where bread will remain in the bread car; the stores will be immediately unloaded and transportation released.

6. Immediately upon receipt of an order at a warehouse for transfer of stores, an application will be made on the depot quartermaster for transportation, stating the number of packages, approximate cubic measurement and weight of shipment, its destination, and the hour by which stores should be delivered, together with the hour and place at which they will be ready to turn over to Quartermaster's Department. The commissary-sergeant in charge of warehouse will make this request, signing name of depot commissary, per his own.

FRESH BREAD.

7. Immediately upon receipt of ration returns at camp office the commissary-sergeant in charge will write an order in triplicate * * * on the commissary-sergeant in charge of bread issues, figuring nine-tenths of rations in fresh bread. This order will show the organization (regiment, separate battalion, or separate company), the ration period, total number of rations carried by the return, and the number of rations of fresh bread to be drawn. One copy will go to commissary-sergeant in charge of bread car, one to the commissary of the organization, and one retained in the office of the depot commissary for final delivery to the post treasurer. The commissary-sergeant in charge of the bread car will indorse on the back of his copy and that of the commissary of each organization, daily, the amount of bread drawn, and shall in no case issue more than the amount called for. The issues as thus recorded will form the basis for calculation of bakery savings, which will be paid to the commissary of the organizations in bulk, to be distributed by him to the various companies of his organization, according to strength. The commissary-sergeant will, in addition to the above, keep a daily record of all bread received, issued, sold, and remaining on hand. He will sell bread only on tickets received from the depot office, authenticated by autograph stamp of post treasurer, except to the headquarters mess, provisional division, to which he will make such issues as are called for by the officer in charge, keeping account of the same, and retaining the orders as his vouchers.

FRESH BEEF.

8. A similar order * * * executed in like manner, as provided in paragraph 7, will be issued for fresh beef, noted, and filed in the same manner.

SALES STORES.

9. The commissary-sergeant in charge of the issues of bread in camp will also be in the sales store. The store will be opened from 9 a. m. to 12 m., and from 1 to 4 p. m., daily, except Sundays, and Wednesday, October 28, when it will be closed for inventory.

10. Sales will be made for cash only, except to the headquarters mess, and as may be provided in orders from division headquarters.

11. The records of the sales store will consist of a cash book, stock book, daily abstract on Form 34, and journal from headquarters mess, and such sales as may be made by orders from division headquarters above mentioned. All cash sales will be made on Form 54, serially numbered. Entries will be made on cash and stock books by the serial number of the blank used in making the sale. Sales to headquarters mess and to enlisted men, on credit, will be entered in stock book according to page of journal bearing the account. * * *

EXHIBIT F.

Amounts of subsistence stores sold in Camp William Cary Sanger during fall maneuvers, from October 13 to October 31, 1903, inclusive.

Fresh beef, 5,509½ pounds; bacon, 1,626½ pounds; beef, corned, 149 cans; beef and vegetable stew, 1-ration can, 5 cans; fish, dried cod, 13 pounds; fish, pickled mackerel, 2½ pounds; fish, salmon, 164 cans; flour, 4,308 pounds; hard bread, 224 pounds; corn meal, white, 178 pounds; corn meal, yellow, 10 pounds; baking powder, 151 pounds; beans, 2,670 pounds; beans, baked, 1-pound can, 30 cans; beans, baked, 3-pound can, 139 cans; rice, 127 pounds; hominy, coarse, 51 pounds; hominy, fine, 10 pounds; potatoes, fresh, 36,056 pounds; onions, fresh, 1,368 pounds; tomatoes,

698 cans; prunes, 70 pounds; apples, 88 pounds; peaches, 132 pounds; jam, black-berry, 405 cans; coffee, green, 97 pounds; coffee, roasted and ground, 165 pounds; coffee, roasted and ground, 12 pounds; tea, black, Oolong, 1½ pounds; tea, black, English breakfast, 19 pounds; tea, green, Young Hyson, 12 pounds; tea, green, gunpowder, 5 pounds; sugar, 1,979 pounds; vinegar, 4½ gallons; salt, 2,074 pounds; pepper, black, 15½ pounds; soap, 495 pounds; candles, 312 pounds; candles, lantern, 126 pounds; matches, safety, 2,717 boxes; paper, toilet, 134 packages; salt, coarse, 185 pounds; alcolia, 4 cans; apples, 3-pound can, 116 cans; apples, gallon can, 120 cans; apricots, 15 cans; bacon, breakfast, 621 pounds; bacon, breakfast, 1-pound can, 27 cans; basins, hand, 83; beef, chipped, 83 cans; beeswax, one-eighth pound; blacking, shoe, 20 boxes; blanco, khaki, 4 boxes; blanco, white, 2 boxes; borax, 13 pounds; brooms, whisk, medium, 8; brushes, blacking, daubers, 7; brushes, blacking, polishers, 11; brushes, nail, 4; brushes, shaving, 9; brushes, tooth, 25; buttons, collar, hinge, 13; buttons, collar, no hinge, 1; can openers, 8; cheese, American, 776½ pounds; chamois skins, 15; chocolate, plain, 31½ pounds; chocolate, vanilla, 43½ pounds; cigars, La Norina, 2,600; cigars, N. O. Plantation, 6,350; cigars, Mercantile, 1,650; cinnamon, ground, 9½ pounds; clothes lines, 650 feet; cloves, ground, 5 pounds; cocoa, breakfast, 12 pounds; coffee, extra Java, 14 pounds; coffee, extra Mocha, 13½ pounds; combs, dressing, 1; combs, horn, medium, 13; combs, horn, small, 3; combs, pocket, 18; corn, 945 cans; crabs, 2-pound can, 2; crabs, pony can, 12; crackers, ginger, 913 pounds; crackers, graham, 223 pounds; crackers, soda, 603 pounds; crackers, soda flake, 32 pounds; envelopes, note, good, 575; electro silicon, 12 boxes; extract of clams, 5 cans; farina, 6 pounds; flavoring extract, lemon, 45 bottles; flavoring extract, vanilla, 58 bottles; flour, 2,400 pounds; gelatin, 16 packages; ginger, 2½ pounds; ham, deviled, 125 cans; ham, sugar-cured, 1,646 pounds; handkerchiefs, linen, 44; ink, black, 15 bottles; ink, indelible, 1 bottle; jelly, currant, 15 cans; jelly, currant, 7 jars; lard, 239 pails; lithia water, 2 bottles; jam, apple, 10-pound kit, 1 kit; macaroni, 547 pounds; metal polish, paste, 5 tins; milk, condensed, 48 cans; milk, evaporated, 3,649 cans; molasses, 14 cans; mushrooms, 32 cans; mustard, French, 39 bottles; mustard, ground, 21 pounds; nutmegs, 1½ pounds; oatmeal, rolled, 1,419 pounds; oatmeal, rolled, 2-pound carton, 146 pounds; olive oil, 65 bottles; olives, 11 bottles; oysters, 23 cans; paper, note, 45 quires; peaches, 2½-pound can, 25 cans; peaches, 3-pound can, 207 cans; pears, 2½-pound can, 17 cans; pears, 3-pound can, 60 cans; pease, 631 cans; pepper, cayenne, one-half pound; pickles, mixed, 64 jars; pineapples, 104 cans; pins, 4 pyramids; pipes, C. C., 68; pipes, B. W., No. 1, 14; pipes, straight stem, 33; pipes, B. W., No. 2, 24; Poland water, 8 bottles; polish, shoe, 39 boxes; polish, shoe, russet, 176 packages; pots, agate, 2; preserves, damson, 2-pound can, 8; razors, 15; salt, 3-pound bag, 352 pounds; salt, 2-pound boxes, 120 pounds; sardines, 106 boxes; sauce, cranberry, 4 cans; sauce, tomato, 65 bottles; sauce, Worcestershire, 74 bottles; shoestrings, linen, black, 132 pairs; shoestrings, linen, russet, 216 pairs; shrimps, 24 cans; sirup, cane, 58 cans; sirup, maple, one-half-gallon can, 16 gallons; soap, laundry, white floating, 142 cakes; soap, scouring, 82 cakes; soap, Pear's glycerin, 85 cakes; soap, oatmeal, 114 cakes; soap, shaving, 36 pounds; soup, chicken, 12 cans; soup, mock turtle, 30 cans; soup, beef, 11 cans; soup, clam chowder, 11 cans; sponges, large, 2; sponges, small, 1; starch, corn, 189 pounds; sugar, cut loaf, 450 pounds; sugar, granulated, 2,390 pounds; sugar, powdered, 18 pounds; tapioca, 21 pounds; tobacco, chewing, 913 pounds; tobacco, smoking, Durham, 94 pounds; tobacco, smoking, plug, Seal of North Carolina, 60 pounds; tobacco, Lone Jack, 2 pounds; tobacco, Yale mixture, 1½ pounds; tobacco, Duke's Cameo, 11 pounds; tobacco, Vanity Fair, 2 pounds; tongue, beef, 156 cans; thread, assorted, 14 spools; tooth powder, 55 bottles; towels, bath, cotton, 30; towels, huckaback, 68; towels, linen, bath, 6; toweling, unbleached, 6 yards.

DETAILS TO THE AGRICULTURAL DEPARTMENT.

Under arrangements made by the Secretary of War with the Secretary of Agriculture some of the officers of the Subsistence Department have been detailed for instruction in the Bureau of Chemistry, United States Department of Agriculture. As many officers as could be spared from other duties, and who by previous education and experience and by present indication of aptitude for the subject, have been so detailed.

The instructions there given are in the line of enabling an officer to intelligently purchase for the Government the stores kept by this

Department for issue and sale. These instructions include the use of the microscope, the polariscope, and the study of qualitative tests (where such tests exist), for determining the presence of adulterations, and such qualitative work as is absolutely essential to intelligent performance of the duties of a purchasing officer.

Three officers of the Department have successfully completed the course and two are now on this detail, one of whom is at present on sick leave.

SETTLEMENT OF ACCOUNTS UNDER ACT OF MARCH 3, 1903.

The above-mentioned act provided for the settlement of certain accounts of disbursing officers of the War Department arising between April 21, 1898, and July 8, 1901. Of this class of unsettled accounts there were 247 which pertained to the Subsistence Department. They have been acted upon with expedition, considering their character and the difficult and tedious routine, and at present there are only 12 pending, which are awaiting reports from the officers concerned. As soon as the necessary information is at hand the remaining accounts will be finally adjusted, and in all probability long before the expiration of the two years (which will expire March 3, 1905) allowed by the act in which to make settlement.

LOUISIANA PURCHASE EXPOSITION.

The following is a report upon subsistence affairs in connection with the Louisiana Purchase Exposition for the fiscal year 1904, by Maj. A. M. Davis, commissary, purchasing commissary, St. Louis, Mo.:

Pursuant to instructions from your office in letter dated June 3, 1904, I have the honor to submit the following report of the connection of this office with the Louisiana Purchase Exposition during the fiscal year ending June 30, 1904:

On March 19 First Lieut. T. B. Taylor, Eleventh Cavalry, under competent authority, opened a commissary on the fair grounds for the battalion of Philippine Scouts, then about due. That office has been maintained as a post-commissary since that date, Second Lieut. J. C. Brady, Fourth Infantry, succeeding Lieutenant Taylor in May.

The purchasing commissary in St. Louis, under directions from your office, occupies the position of chief commissary to organizations in the fair grounds, their requisitions for rations and sales stores coming direct to him.

Since the opening of the scout commissary about 38,000 rations and \$775 worth of sales stores have been supplied to it. The receipts from sales amount to enough to furnish the commissary with sufficient funds to pay savings to the organizations, and this office pays for the beef, fresh bread, and ice needed.

The contract for beef for the scouts was with Armour & Co., at 5.49 cents per pound. Fresh bread was furnished by contract with the Heydt Bakery Company, at 3.4 cents per pound. Both commodities were excellent in quality. The furnishing of ice to all parties in the fair grounds is a concession, hence no contract was made, as there was no competition. The price paid has been 35 cents per 100 pounds.

The amounts disbursed for these various items have been as follows:

Fresh beef	\$1,628.05
Fresh bread	1,138.19
Ice	100.25

The cost of the ration averaged 16½ cents.

The One hundred and nineteenth Company Coast Artillery was sent to the fair grounds last November, and arrangements were made for its accommodation by the company commander, Capt. Archibald Campbell, Artillery Corps, with the Park Boarding and Commissary Company.

After considerable correspondence on the subject between this office and the commissary general, a contract was made with the Park Boarding and Commissary Com-

pany to supply meals for the company of artillery, and other soldiers attached to it, at 34 cents per man per day, provided such men were quartered by the contractor.

Under these arrangements there has been paid by this office to the above-named concern, for the fiscal year ending June 30, 1904, \$4,662.08. This includes payment of subsistence furnished the First Cavalry band, present during June. The contract has been renewed for the first six months of the current fiscal year.

Under authority granted by the commissary-general a payment of 60 cents per day per man, for such enlisted men as were not housed by the Park Boarding and Commissary Company has been made for the detachment of the Hospital Corps on duty at the fair. The amount so disbursed has been \$1,157.40.

In addition to the above classes of payments, commutation of rations for men on duty at the fair, and not attached to either the artillery company or Hospital Corps, have been made to the amount of \$3,984.

Contracts have been made for supplying fresh beef and fresh bread for the first six months of the current fiscal year.

ICE AND ICE MACHINES.

General Orders, No. 111, Adjutant-General's Office, July 29, 1903, provide under what conditions ice shall be supplied by the Subsistence Department, which are as follows:

Where ice can be furnished to organizations of enlisted men of the Army it may be issued by the Subsistence Department where rations are issued in kind at not more than 2 pounds for each ration, subject to the following conditions: The maximum allowance to any organization or detachment to be 100 pounds per day. No allowance of ice will be made to troops stationed north of the forty-third parallel of north latitude, except as provided below. To troops stationed between the thirty-seventh and forty-third parallels of north latitude and in the States of Washington, Oregon, and Idaho the allowance will be for six months only, beginning the 16th of April, and ending the 15th of October. To troops stationed south of the thirty-seventh parallel of north latitude the allowance will be for the whole year. No savings or wastage will be allowed on ice. Allowance of ice will not be subject to commutation.

But the foregoing order was modified by General Orders, No. 117, War Department, June 28, 1904, in which it is provided that at posts or stations where ice machines are operated by the Quartermaster's Department the Subsistence Department is not required to supply ice.

The following is a list of ice machines and capacity of same at the various posts in the United States, the Philippines, and Porto Rico, so far as known at this office:

[Capacity in 24 hours.]

United States:	Pounds.	Philippines—Continued.	Pounds.
Fort Apache, Ariz.....	2,000	Camp Warwick	4,500
Fort Bayard, N. Mex.....	3,000	Corregidor Island	2,500
Fort Grant, Ariz.....	3,000	Iloilo	5,000
Fort Huachuca, Ariz.....	3,000	Jolo	5,000
Fort Sill, Okla.....	3,000	Camp Daraga.....	5,000
Fort Brown, Tex.....	1,000	Malabang.....	2,500
Fort Clark, Tex.....	3,000	Camp Downes.....	2,500
Fort McIntosh, Tex.....	3,000	Camp Bumpus.....	2,000
Fort Ringgold, Tex.....	1,500	Zamboanga.....	3,500
Fort Morgan, Ala.....	2,000	Camp Jossman.....	4,000
Fort St. Philips, La.....	2,000	Cottabato.....	2,400
United States Army General		Camp Connell.....	3,500
Hospital, Hot Springs, Ark.	2,000	Lucena.....	4,200
Presidio of San Francisco, Cal.	.....	Camp McGrath.....	3,200
Philippines:		Iligan.....	2,500
Camp Overton.....	5,000	Batangas.....	3,500
Camp Wallace.....	2,400	Porto Rico:	
Calamba.....	2,500	San Juan.....	

PHILIPPINES DIVISION.

1. GENERAL REMARKS.

The transfer of troops to and from the United States and shifting of those in the islands, rapid abandonment of posts, difficulties of transportation, trying climatic conditions, and other matters helped to make a difficult problem. But it has been successfully solved, and subsistence affairs in the Archipelago now run with system and economy. By closest attention to the markets and all matters pertaining to supply, the Subsistence Department was enabled to make a contract for the fiscal year 1905 for the finest quality of fresh beef, by which an annual saving of over \$140,000 was effected, as compared with the contract for the previous fiscal year. The quantity received during the year was approximately 6,800,000 pounds at 8.6 cents per pound, as against 6½ cents, which will be the price for the fiscal year 1905. The running expenses have gradually been reduced to a minimum, and a saving of upward of \$40,000 made in wages of civilian employees alone.

To accomplish these results required untiring effort and executive qualifications of a high order, and the Department was fortunate in the selection of Col. Henry G. Sharpe, as chief commissary of the Philippines Division, who brought about these satisfactory results. He performed arduous and important service and had a successful administration, but paid the inevitable penalty, for strain and overwork impaired his health and it became imperative to order him to the United States, after two years' service, to prevent a complete breakdown.

Colonel Sharpe had efficient and loyal assistants among the officers of the corps stationed in the islands during the period of his service as chief commissary of the division, and was fortunate in having Major Baldwin in the depot.

2. SOURCES OF SUPPLY.

The greater portion of articles for sale were supplied from New York. Chicago, Kansas City, and Omaha furnished the salt meat and meat products and several other items. St. Louis was drawn upon for a few articles, which could be procured at favorable figures in that market. Purchases were made in Manila of such supplies as could be procured to advantage in that city.

3. QUALITY OF SUPPLIES

The chief commissary of the Philippines Division remarks on the subject of the supplies received:

The stores received are good in quality and condition, and the supplies at present in the depot commissary are reduced to a stock sufficient to meet the wants of the command for a reasonable period of time, and fresh stock only is received and issued out to posts throughout the division.

4. FRESH BEEF.

The quality of the beef was excellent and the supply ample. On the subject of the meat supply the chief commissary of the division says:

With very few exceptions every post in this division, garrisoned by regular troops, have been supplied with their full allowance of fresh beef. Of the posts not receiving their full allowance, Bongao and Siassi are furnished beef from Jolo at every opportunity available. Camp Marahui, Mindanao, in March, 1904, received fresh beef 11½ days; Camp Vicars, 13 days; Malabang, 14 days; Parang, 17 days, and Sorsogon, Luzon, 11 days. To posts garrisoned by native scouts, fresh beef is for-

warded at every opportunity. There is not a post in the division that does not receive some fresh beef each month. * * * Effort has been made to procure fresh fish for the scout companies stationed at seacoast points, to be issued in lieu of part of the meat ration, which has been unsuccessful, due to the fact that reports are that very little fish is caught, and that it is impossible to make arrangements with any one living in the vicinity to catch the same. * * *

The proposals for furnishing frozen fresh beef in this division during the next fiscal year resulted in securing a contract at a very satisfactory price, and provides for the delivery of hind-quarter meat only, which keeps very much better in this climate.

5. FRESH VEGETABLES.

The fresh vegetable portion of the ration is a very desirable element of the soldier's fare, but is one upon which great losses occur and are unavoidable. The chief commissary of the Department of Mindanao states:

Recent experiments at Malabang, by the postmaster, demonstrated that a fine quality of onion, string bean, sweet corn, tomato, cabbage, and radish can be raised. He is about to make further experiments with these same vegetables and potatoes at Marahui. It is recommended that instructions be given for the planting of post and company gardens. They would greatly add to the soldier's mess; to his company fund, by having the vegetable component of the ration commuted, and would be a saving to the Government, in freight and loss en route, if they could be depended upon entirely for the vegetables of the ration.

6. FILIPINO RATION.

On April 4, 1904, General Orders, No. 62, of the War Department were issued prescribing a new Filipino ration, based on the ration established in 1902, in which only slight modifications were made. The following table shows the articles, quantities per ration, and per 100 rations:

Articles.	Quantities per ration.		Quantities per 100 rations.		
	Ounces.	Gills.	Pounds.	Ounces.	Quart.
Meat components:					
Fresh beef.....	12		75		
or bacon.....	8		50		
or canned meat.....	8		50		
or canned fish.....	12		75		
or fresh fish.....	12		75		
Bread components:					
Flour.....	8		50		
or hard bread.....	8		50		
Baking powder (when in field and ovens are not available).....	$\frac{1}{8}$		2		
Vegetable components:					
Rice.....	20		125		
Potatoes.....	8		50		
or onions.....	8		50		
or desiccated vegetables.....	$1\frac{1}{2}$		7	8	
Coffee and sugar components:					
Coffee, roasted and ground.....	1		6	4	
Sugar.....	2		12	8	
Seasoning components:					
Vinegar.....		$\frac{1}{8}$			1
Salt.....	$\frac{1}{16}$		4		
Pepper, black.....	$\frac{1}{16}$			2	
Soap and candle components:					
Soap.....	$\frac{1}{16}$		4		
Candles.....	$\frac{1}{8}$			12	

7. OVENS.

The chief commissary of the Philippines Division, in commenting on ovens, remarks:

While all the posts in the division garrisoned by American troops have ample baking facilities, a large number of such posts are provided with the Blodgett oven, a most unsatisfactory oven for use at a post, because it is a "flash" oven, and it is almost impossible to bake bread in same no matter what may be the quality of the

flour and the other ingredients of the bread or the ability of the baker, and while this oven is termed a field oven, it is a perfect misnomer, as the size of it is so large that it can hardly be packed in an escort wagon and not more than one oven can be put in a wagon at a time. It is recommended that suitable ovens be provided at all of the permanent posts occupied throughout this division, and that steps be taken to insure that a number of field ovens of the most recent pattern are always on hand in this division to provide for unexpected field movements. Attention is invited to the fact that until 1894 ovens were always furnished by the Subsistence Department, and that year, by direction of the Secretary of War, the furnishing of ovens was transferred from the Subsistence Department to the Quartermaster's Department. In view of the infinite number of supplies which are furnished by the Quartermaster's Department, and also to the fact that the Subsistence Department is charged with the duty of furnishing bread, it is thought that it would be advisable to have the duty of furnishing ovens retransferred to the Subsistence Department. The appropriation for the Quartermaster's Department, from which ovens are bought, also covers a variety of other necessary articles, so that an expenditure of a considerable amount for purchase of ovens would necessarily preclude the furnishing of other equally necessary quartermaster supplies. This is believed to be the explanation for the fact, as shown in the Quartermaster-General's report to the Dodge Commission at the close of the Spanish-American war, that on April 1, 1898, there were no field ovens on hand in the Army, although the duty of furnishing ovens had been intrusted to the Quartermaster's Department four years previous. It is therefore recommended, for the best interests of the service, the advisability of retransferring to the Subsistence Department the duty of furnishing permanent and field ovens.

8. SUBSISTENCE FUNDS LOST AND STOLEN.

The amount of such funds lost and stolen during the fiscal year was as follows:

In currency, lost by accountable officer, who has since been dismissed from the Army.....	\$722.94
In currency, failure of officer to make good amount paid out for worthless postal money orders. Effort made to have amount stopped from officer's pay	204.89
In currency, lost through robbery of post-office. All checks, payment on which has been stopped	3,009.63

9. OFFICERS.

In speaking of the officers of the Subsistence Department who served in the division, the chief commissary of the division says:

The officers of the Subsistence Department in this division have satisfactorily performed their duties throughout the year. Acknowledgment is due to Majors Baldwin and Hart and Captain Bottoms for assistance rendered this office.

10. POST COMMISSARY SERGEANTS.

The following statement concerning post commissary sergeants is submitted by the chief commissary, Philippines Division:

On June 30, 1903, there were 73 post commissary sergeants stationed in this division. At the present time there are 65, stationed as follows:

In Department of Luzon	32
In Department of the Visayas	8
In Department of Mindanao	11
In depot commissary, Manila	7
On interisland transports	4
In Peking, China	1
Awaiting transportation to United States	2
Total	65

In addition the records show that there are 8 regimental commissary sergeants performing duty in this division. These, however, are stationed at posts where a post commissary sergeant is also on duty, except at one post, Cottabato, where the regimental commissary sergeant is alone. The recommendation made in my last annual report that the grade of regimental commissary sergeant be abolished, is renewed for the reasons therein stated.

11. CIVILIAN EMPLOYEES.

Civil-service classification—Under Executive order of March 1, 1904, the following concerning the application of civil-service rules to the service of the War Department in the Philippines was promulgated:

All positions in the civil service of the War Department in the Philippines, except those filled by persons employed merely as skilled or unskilled laborers, and by persons appointed by the President, will be treated as classified under the civil-service rules. The present occupants of these positions who have been specially commended for retention by their chiefs, with the approval of the Secretary of War, and whose names appear on the list furnished the United States Civil Service Commission, may be retained, and after three years' service in such positions shall be eligible for transfer to competitive positions in the United States, subject to the Civil Service Rules and Regulations.

RATIONS TO CIVILIAN EMPLOYEES.

On this feature the chief commissary of the division remarks:

In connection with the foregoing attention is invited to the fact that about 5,000,000 rations were issued to regular troops, Philippine Scouts, and prisoners of war during the present fiscal year to March 31, 1904, at a cost of \$924,697.27, and during the same period about 1,000,000 rations were issued to civilian employees of the War Department at a cost of about \$150,000. In other words, during the period above mentioned, for every 5 enlisted men in this division there was 1 civilian employee to whom rations were issued. No rations are issued by the Subsistence Department to any of the employees in the depot commissary in Manila, either American or native, and the rate of compensation paid these men is not greater than that paid in other departments at posts throughout the division. It is the practice of this office not to permit the issue of rations to civilian employees, particularly the natives. There are some posts where the natives can not be employed unless rations are issued, but the general rule is not to provide rations, so that the amount of rations issued to the Subsistence Department throughout this division may be omitted from the 1,000,000 referred to above. The uncertainty of the number of civilian employees of other departments to whom rations are issued makes it very difficult to provide the proper amount of stores being shipped to posts, and frequently a large number of employees are obtained at a post without any information being communicated to this office in advance so as to provide for the supply of same.

COST OF CIVILIAN EMPLOYEES.

While the number of employees throughout this division is large, still, when the magnitude of the business transacted by the Subsistence Department in the division in one year is considered, it is thought that the cost of the employees of the Subsistence Department, amounting to about 4½ per cent of the total business of the department, is not excessive.

12. DEPOT COMMISSARY.

The following extracts from the report of Maj. W. H. Baldwin, commissary, depot commissary, at Manila, deals with matters in connection with the depot at that place:

The personnel of this office consists in the depot commissary, 3 commissary officers, as assistants, who supervise different branches of the work of the depot; these gentlemen have given the most efficient cooperation; 8 commissary-sergeants, on duty in different warehouses, and 4 on interisland transports. The force of civilian employees of the depot is as follows: 27 clerks, American; 6 clerks, native; 5 laborers, American, and 141 laborers, native. This shows a reduction since July, 1903, of 6 clerks, American; 1 laborer, American, and 39 laborers, native, or a saving to the Government, in wages alone, of \$12,767.88 United States currency a year.

The clerical force is very efficient, and duties performed by noncommissioned staff very satisfactory. The taking into the civil service of the emergency clerks appears to be appreciated by these men. It is recommended that all those men who have been in the service over three years in these islands be given an opportunity to serve in the United States, and that those who wish to remain in the Philippines, but desire leave of absence to visit the United States, be granted leaves, to begin upon arrival in the United States, and to cease upon leaving. The ruling at present that a "leave" begins upon departure from Manila is prohibitive. The work of the native force at the depot has also been very satisfactory.

Approximately 7,000 shipments have been made from this depot to the different posts throughout the islands during the period covered by this report, and, in addition to this, the following number of rations have been issued directly by this office, viz:

To troops	1, 177, 873
To Philippine Scouts	106, 354
To civilian employees	392, 806
To native employees, paid from insular funds	403
To American prisoners of the United States in Bilibid prison	3, 458
To native prisoners of the United States, in Bilibid prison	8, 771

Total number of rations issued

1, 689, 665

As a means of securing a more economical administration, on July 1, 1903, the sales commissary in Manila, was consolidated with the depot. The following sales have been made during the period covered by this report:

Sales to officers, enlisted men, post exchanges, etc.	\$209, 772. 03
Sales to civilian employees (10 per cent added)	63, 751. 99
Sales to United States Navy and Marines (10 per cent added)	136, 677. 65
Sales to United States Coast and Geodetic Survey (10 per cent added) ..	5, 787. 55
Sales to insular coast guard (10 per cent added)	3, 093. 83
Sales to insular government (10 per cent added)	13, 425. 25

Total sales

432, 508. 30

The surplus and deteriorated stores remaining from the time when a large force was maintained in these islands have been exhausted through sales at auction and condemnation, followed by destruction. A large proportion of the stores that were destroyed had been in the provinces, and were returned to the depot in an unsatisfactory condition. The supplies thus disposed of represents the principal loss in the islands. The loss sustained at the depot from deterioration due to climatic causes was small.

Cuartel Fortin was relinquished by the army in the early part of last May, the depot losing the best location in Manila and the warehouse most suitable for the purpose. This increases the cost to the United States Government about \$10,000 United States currency a year. The new location of the depot is very convenient, but the character of the buildings and their arrangement is not entirely satisfactory. It is expected that the only warehouse at present leased by the Government for this depot, will, in a few weeks, be given up.

There were 320,061 packages received from the United States, weighing 23,827,946 pounds, valued at \$1,240,787.78, with net loss of \$133.42—per cent of loss being 0.000107. This net loss may be slightly increased by outstanding boards of survey.

13. INTERISLAND TRANSPORTS AND REFRIGERATOR BOATS.

The feature of interisland transportation is of first importance in any scheme for rationing troops scattered throughout the archipelago. In connection with the subject the chief commissary of the division states:

The interisland transports have been running on regular schedule, and the matter of supplying posts throughout the division was rendered a comparatively easy one. The refrigerator boats *Wright* and *Seward* have distributed large quantities of meat throughout the division, and have in every way shown the advisability of their retention; but it is to be noted, however, that it seems to be necessary to lay these boats off quite frequently for repairs, and when such is done the only means of supplying fresh beef to posts situated to the south of Manila is gone.

14. REFRIGERATION AND STOWAGE OF FRESH BEEF.

Conditions existing in the Philippines have during the past few years called for the purchase of large quantities of frozen beef and mutton, the supply of which has been attended with satisfactory results. While the methods pursued in the refrigeration, storing, and handling of

frozen meat vary in minor details the procedure may be outlined as follows:

After the cattle are slaughtered the carcasses are allowed to hang from thirty to forty-five minutes in order that the blood may properly drain off. Skinning and splitting them follow, after which the sides are conveyed to the chill rooms by means of an endless-chain system, each side being carried separately. The temperature of the chill rooms ranges from 30° or 32° to 36° F.; this temperature will rise to 38° or 40° F. when the warm beef is introduced, but is afterwards brought down to 30° or 32°.

After at least twenty-four hours in the cooling room (some packers allow forty-eight to seventy-two hours) the sides are quartered and sent on to the freezing room, where a temperature of from zero to 10° above is maintained, and the quarters allowed to hang until frozen solid, the time necessary to accomplish this being four to six days.

Mutton receives the same treatment, but the carcass is carried through whole. When the quarters are thoroughly frozen they are wrapped in muslin, sometimes with a covering of burlap in addition, and are then ready for shipment. For frozen meat in store 15° F. is a safe temperature to maintain, and it has been found that at about this temperature (a few degrees variation not being material) meat will keep indefinitely. But alternate thawing and freezing is injurious, as is also contact with warm air, for which reason it is desirable that storage rooms be so arranged and subdivided as not to necessitate the frequent opening of doors and exposure of meat, except limited amounts which are to be consumed at an early date.

SPACE REQUIRED FOR STORAGE.

The cubical space required for the storage of a given weight of frozen beef will vary with the size of the quarters and the care exercised in storing. On steamers 100 cubic feet are allowed for 1 ton (2,240 pounds) of beef and 120 cubic feet for the same weight of mutton. In cold-storage rooms better suited for stowing it has been found that 90 to 92 cubic feet will accommodate 1 ton (2,240 pounds) of frozen beef and 100 cubic feet 1 ton of mutton. In the above cases the quarters are stowed flat, the position of each quarter being the reverse of the next quarter above or below it in the pile. Mutton is stowed flat and requires less care in placing than beef to secure economy in space. Stowed hanging beef would require 180 cubic feet and mutton 200 cubic feet per ton of 2,240 pounds. The economy in space, therefore, of stacking over hanging is marked. In this connection it may be noted that packers claim that the meat will keep as well stacked as hung. A further economy results when the meat is stacked, due to the fact that it takes less from the machines to keep a room at a certain temperature in proportion as the air space is reduced and the quantity of frozen meat increased.

CARE OF FROZEN MEAT WHEN REMOVED FROM FREEZING ROOM.

The length of time that frozen meat will keep when removed from cold storage depends upon the various conditions to which subjected. Under the least favorable conditions as to climate and means of protection, a quarter of beef thoroughly frozen will keep good for twenty-four hours. This time may be increased to three or four days by covering the quarters with wax paper and closely woven burlap.

Refrigerator cases or boxes are used in forwarding small amounts packed with ice, and can be depended upon to preserve the meat for at least six days.

15. ACCOUNT AGAINST CIVIL GOVERNMENT OF PHILIPPINE ISLANDS.

The following statement shows the money value of subsistence stores charged against the civil government of the Philippine Islands on account of issues made by the Subsistence Department to Filipino convicts, scouts, destitutes, civil employees (linemen of the Signal Corps), carpenters, and white civil scouts, amount collected therefor from civil funds of the Philippine Islands, and amount for which no reimbursement has been received:

	Fiscal years—								Total.	
	1901.		1902.		1903.	1904.				
	Value of issues.	Collections.	Value of issues.	Collections.	Value of issues.	Value of issues.	Collections.	Value of issues.	Collections.	
Convicts.....	\$24,637.53	\$17,494.48	\$19,639.60	\$2,537.97	\$3,517.43	\$821.64	\$75.63	\$48,616.20	\$20,108.00	
Native scouts.....	77,906.40	13,437.18	53,983.76	23,773.62				131,890.16	37,210.80	
Destitutes.....	1,398.38	51.24	4,394.24	365.11	2,804.50	20.72		8,617.84	416.35	
Civil employees (linemen of the Signal Corps).....			3,442.29		5,394.93	1,408.60		10,245.82		
Carpenters, St. Louis Exposition.....						19.73	19.73	19.73	19.73	
Civil scouts (white).....			4,319.69	901.27				4,319.69	901.27	
Total.....	103,942.31	30,982.90	85,779.58	27,577.97	11,716.86	2,270.69	95.36	208,709.44	68,656.25	
Balance due Subsistence Department.....	72,959.41		58,201.61		11,716.86	2,175.33		145,053.21		

Under the provisions of the act of April 23, 1904, and the decision of the Secretary of War by virtue of the authority reposed in him by that act, the foregoing account for \$145,053.21, due the Subsistence Department from the civil government of the Philippine Islands and uncollected, was, without further payment, declared to be settled and satisfied.

The act reads:

The Secretary of War is authorized, if in his judgment the conclusion be an equitable one, to declare the existing open accounts between the civil government of the Philippine Islands and the Government of the United States to be settled and satisfied * * *. The order of the Secretary of War in this behalf, with respect to the accounts of the Ordnance, the Subsistence, the Quartermaster's, and the Signal Corps shall be taken as a balancing and final adjustment and settlement of such accounts.

The decision of the Secretary of War giving efficacy to the foregoing, declares:

After an examination of the report of the civil governor of the Philippine Islands and of the officers appointed by the commanding general of the Division of the Philippines, in respect to the existing open accounts between the civil government of the Philippine Islands and the Government of the United States, I declare that in my judgment the closing of such accounts, without further payments on either side, as settled and satisfied accounts, is an equitable one * * *. As provided in the act, this order closes the accounts of the Ordnance, the Subsistence, the Quartermaster, and the Signal Corps against said civil government, and is to be deemed a final adjustment, settlement, and satisfaction of such accounts.

J. F. WESTON,
Commissary-General.

REPORT OF THE SURGEON-GENERAL.

REPORT OF THE SURGEON-GENERAL.

WAR DEPARTMENT,
OFFICE OF THE SURGEON-GENERAL,
Washington, D. C., August 31, 1904.

SIR: I have the honor to report upon the Medical Department of the Army during the fiscal year ended June 30, 1904, beginning with a statement of finances.

FINANCIAL STATEMENT, 1904.^a

Medical and hospital department, 1904.

Appropriated by act approved March 2, 1903.....	\$450,000.00	
Transferred from medical and hospital department, 1902, by act approved April 27, 1904.....	200,000.00	\$650,000.00
Refundments on account of supplies transferred:		
To Quartermaster's Department, U. S. Army.....	789.00	
To Navy Department.....	1,966.53	
To States and Territories for use of organized militia..	43,968.22	
Refundments on account of sales to civil government, Philippine Islands.....	2,299.36	
Other refundments during the year (including transfer settlements by Treasury Department to adjust appropri- ations, \$759.79)	1,052.37	50,075.48
Total to be accounted for		700,075.48
Disbursed during the year:		
Expenses of medical supply depots.....	645.05	
Medical supplies	303,632.50	
Medical attendance and medicines.....	9,871.20	
Medical expenses of recruiting.....	40,069.93	
Pay of nurses.....	1,831.40	
Pay of other employees.....	131,116.69	
Washing of hospital linen	22,541.59	
Expressage	1,082.93	
Notary fees	48.50	510,839.79

^a The disbursements in this statement include settlements with public creditors made by the accounting officers of the Treasury and charged by them to these appropriations.

REPORT OF THE SURGEON-GENERAL.

Balances on hand June 30, 1904:

In United States Treasury and in transit thereto.....	\$86,674.06	
In hands of disbursing officers—		
New York City	65,709.88	
Washington, D. C.....	13,315.89	
St. Louis, Mo.....	10,669.82	
San Francisco, Cal.....	7,670.25	
Manila, P. I.....	5,157.00	
Peking, China	38.79	
		<u>\$189,235.69</u>
Total accounted for.....		700,075.48

Medical and hospital department, 1903.

Balance on hand July 1, 1903, act of June 30, 1902.....	\$604,596.27	
Refundments on account of supplies transferred:		
To Navy Department.....	\$2,287.40	
To Ordnance Department, U. S. Army.....	2.50	
Refundment on account of sale to civil government, Philippine Islands.....	572.18	
Other refundments during the year.....	4,154.77	
		<u>7,016.85</u>
Total to be accounted for.....		<u>611,613.12</u>

Disbursed during the year:

Expenses of medical supply depots	128.62	
Medical supplies	337,336.64	
Medical attendance and medicines.....	2,716.94	
Medical expenses of recruiting	2,991.89	
Pay of nurses	242.23	
Pay of other employees.....	2,014.67	
Washing of hospital linen.....	2,437.56	
Expressage	71.13	
Notary fees	31.25	
		<u>347,970.93</u>
Transferred by Treasury settlement to adjust appropriations.....		759.79
Balance on hand June 30, 1904, in United States Treasury.....		262,882.40

Total accounted for..... 611,613.12

Medical and hospital department, 1902.

Balance on hand July 1, 1903, act of March 2, 1901	\$426,881.47	
Refundments during the year.....	180.49	

Total to be accounted for..... 427,061.96

Disbursed during the year:

Medical supplies	\$70.70	
Medical attendance and medicines	147.15	
Medical expenses of recruiting	6.00	
Pay of employees	7.00	
Washing of hospital linen	17.42	
By Treasury settlement with owner of lost check covering payment previously classified	36.50	
		<u>284.77</u>

Transferred to medical and hospital department, 1904, by act of April 27, 1904.....	200,000.00	
Carried to surplus fund.....	226,777.19	

Total accounted for..... 427,061.96

Medical and hospital department, 1901 and prior years.

Refunded during the year	\$4.80	
Carried to surplus fund.....	4.80	

Medical and hospital department, certified claims.

appropriated by act approved February 18, 1904	\$33. 80
appropriated by act approved April 27, 1904	41. 34
Total to be accounted for	<u>75. 14</u>
disbursed during the year	<u>75. 14</u>

Reimbursement to contract nurses.

Balance on hand July 1, 1903, act of June 6, 1900	\$3, 278. 98
Balance on hand June 30, 1904, in United States Treasury	3, 278. 98

Report of Army Board on origin and spread of typhoid fever, 1903-4.

Balance on hand July 1, 1903, act of March 3, 1903	\$24, 420. 00
disbursed during the year	<u>1, 729. 46</u>
Balance on hand June 30, 1904:	
In United States Treasury	\$22, 420. 00
In hands of disbursing officer, Washington, D. C.	270. 54
	<u>22, 690. 54</u>
Total accounted for	<u>24, 420. 00</u>

Artificial limbs, 1904.

appropriated by act approved March 3, 1903	\$152, 000. 00
disbursed during the year	<u>141, 269. 27</u>
Balance on hand June 30, 1904	10, 730. 73

Artificial limbs, 1903.

Balance on hand July 1, 1903, act approved June 28, 1902	\$58, 371. 76
disbursed during the year	\$6, 152. 92
transferred by Treasury settlement to adjust appropriations	50. 00
	<u>6, 202. 92</u>
Balance on hand June 30, 1904, in United States Treasury	52, 168. 84

Artificial limbs, 1902.

Balance on hand July 1, 1903, act approved March 3, 1901	\$4, 917. 17
funded during the year by Treasury settlement to adjust appropriations	50. 00
Total to be accounted for	<u>4, 967. 17</u>
disbursed during the year	<u>135. 18</u>
transferred to surplus fund	4, 831. 99
Total accounted for	<u>4, 967. 17</u>

Artificial limbs, certified claims.

appropriated by act approved February 18, 1904	\$29. 62
disbursed during the year	<u>29. 62</u>

Appliances for disabled soldiers, 1904.

appropriated by act approved March 3, 1903	\$2, 000. 00
disbursed during the year	<u>1, 236. 10</u>
Balance on hand June 30, 1904	763. 90

REPORT OF THE SURGEON-GENERAL.

Appliances for disabled soldiers, 1903.

Balance on hand July 1, 1903, act approved June 28, 1902.....	\$924. 09
Disbursed during the year	101. 00
Balance on hand June 30, 1904	823. 09

Appliances for disabled soldiers, 1902.

Balance on hand July 1, 1903, act approved March 3, 1901	\$462. 02
Carried to surplus fund	462. 02

Army Medical Museum, 1904.

Appropriated by act approved March 2, 1903.....	\$5, 000. 00
Disbursed during the year	4, 088. 71
Balance on hand June 30, 1904	911. 29

Army Medical Museum, 1903.

Balance on hand July 1, 1903, act approved June 30, 1902.....	\$1, 462. 38
Disbursed during the year	1, 385. 04
Balance on hand June 30, 1904	77. 34

Army Medical Museum, 1902.

Balance on hand July 1, 1903, act approved March 2, 1901	\$1, 887. 57
Carried to surplus fund	1, 887. 57

Library, Surgeon-General's Office, 1904.

Appropriated by act approved March 2, 1903	\$10, 000. 00
Disbursed during the year	6, 507. 22
Balance on hand June 30, 1904	3, 492. 78

Library, Surgeon-General's Office, 1903.

Balance on hand July 1, 1903, act approved June 30, 1902.....	\$2, 201. 53
Disbursed during the year	2, 112. 61
Balance on hand June 30, 1904	88. 92

Library, Surgeon-General's Office, 1902.

Balance on hand July 1, 1903, act approved March 2, 1901	\$18. 33
Disbursed during the year	9. 25
Carried to surplus fund	9. 08
Total accounted for	18. 33

Burnishing trusses to disabled soldiers (sections 1176, 1177, and 1178, Revised Statutes, and act of March 3, 1879).

Balance on hand July 1, 1903	\$1, 162. 31
Drawn during the year	5, 781. 90
Total to be accounted for	6, 924. 21
Disbursed during the year	6, 070. 81
Balance on hand June 30, 1904	853. 40
Total accounted for	6, 924. 21

General summary of all appropriations.

Balances on hand July 1, 1903	\$1, 130, 583. 88
Appropriated	624, 866. 66
Refunded	56, 517. 83
Total to be accounted for	<u>1, 811, 968. 37</u>
Disbursed	1, 029, 997. 82
Carried to surplus fund	233, 972. 65
Balances on hand June 30, 1904	<u>547, 997. 90</u>
Total accounted for	1, 811, 968. 37

ARTIFICIAL LIMBS AND APPARATUS.

Under the laws relating to artificial limbs, apparatus, or commutation therefor, orders on manufacturers were given during the fiscal year for 36 artificial legs and 2 arms, and commutation certificates were issued for 159 cases of amputated leg, 116 amputated arm, 13 amputated foot, and for 2,410 cases of the loss of use of a limb.

Under the act of June 17, 1870, and subsequent amendments thereto, 22,895 disabled soldiers and sailors have been furnished artificial limbs or apparatus, or have received commutation in money, as follows: Total number benefited to June 30, 1904, 22,895; died, 9,371; dropped from rolls, 590; rejected after one or more payments, 552; remaining on rolls at the end of the fiscal year, 12,382.

Two-thirds of the periodical claims for the benefits under the artificial-limb laws for the three years commencing July 1, 1905, and ending June 30, 1908, become due in the fiscal year 1906. To meet these claims it is estimated that the sum of \$450,000 will be required.

APPLIANCES AND TRUSSES.

One hundred and sixty-seven appliances were issued during the fiscal year, and 805 trusses were furnished and fitted.

CARE OF DESTITUTE PATIENTS IN THE PROVIDENCE HOSPITAL,
WASHINGTON, D. C.

The act approved March 3, 1903, having appropriated \$19,000 for the support and medical treatment of destitute patients in the city of Washington, D. C., under a contract to be made with Providence Hospital by the Surgeon-General of the Army, the relief afforded was as follows:

Patients in hospital July 1, 1903	114
Admitted during the year	<u>1, 053</u>
Total number treated	1, 167
Average number admitted per month	97
Number remaining in hospital June 30, 1904	98
Total number of days' treatment afforded	39, 589
Average number of days' treatment per patient	34
Average number of patients treated per day	108
Longest term of treatment (days)	366
Shortest term of treatment (day)	1
Number of patients in hospital during the whole year	4

MEDICAL OFFICERS, UNITED STATES ARMY.

The number of medical officers allowed by law at present is 322, while the number in service June 30, 1904, was 307, leaving 15 vacancies at the end of the fiscal year.

The following changes occurred during the year:

Appointments.—Two colonels, assistant surgeons-general, appointed brigadier-generals in the line with a view to retirement as such; and 30 first lieutenants, assistant surgeons.

Promotions.—Four lieutenant-colonels, deputy surgeons-general, to be colonels, assistant surgeons-general; 4 majors, surgeons, to be lieutenant colonels, deputy surgeons-general; 5 captains, assistant surgeons, to be majors, surgeons; and 25 first lieutenants, assistant surgeons, to be captains, assistant surgeons.

Twenty-four first lieutenants, assistant surgeons, were examined for promotion during the fiscal year, 6 of whom failed to qualify, and under the law their promotion was suspended for one year, subject to reexamination at the end of that period. Of the 13 captains, assistant surgeons, examined, none failed to qualify.

Resignations.—Three first lieutenants, assistant surgeons.

Retirements.—Four colonels, assistant surgeons-general, 2 as brigadier-generals in the line; 1 major, surgeon; and 1 first lieutenant, assistant surgeon.

Army medical boards for the examination of candidates for appointment in the Medical Corps of the Army have been in session during portions of the last fiscal year in Washington, D. C., San Francisco, Cal., and Manila, P. I. The following is a summary of the work performed by each board:

Washington, D. C.:

Number of candidates invited to appear.....	120
Declined to appear	11
Failed to appear.....	20
	31
Number of candidates examined.....	80
Approved.....	15
Physically disqualified.....	25
Withdrew	4
Rejected.....	45

San Francisco, Cal.:

Number of candidates invited to appear.....	11
Declined to appear	1
Failed to appear.....	3
	4
Number of candidates examined	7
Approved.....	1
Physically disqualified.....	1
Withdrew	2
Rejected.....	3

Manila, P. I.:

Number of candidates examined	5
Approved.....	1
Physically disqualified.....	2
Withdrew	1
Rejected.....	1

Of the 101 candidates examined by these boards, 17 were found physically and professionally qualified and approved for appointment

in the Medical Corps of the Army, while 56 withdrew during the progress of the examination or were rejected at its conclusion, and 28 were rejected as physically disqualified for the service. The proportion of approved candidates shows a decrease when compared with the previous year, as only 16.83 per cent were successful during the last period, while the percentage of approved candidates examined by the board at Washington also decreased to 16.85 per cent, showing conclusively that the high standard of the examination is being fully maintained.

A bill to increase the efficiency and enlarge the Medical Department of the United States Army, so as to do away with the necessity of employing many contract surgeons, was prepared in this office and approved by The Honorable The Secretary of War, February 18, 1904. In this bill it is proposed to give the Medical Department of the Army like advantages in the way of promotion with the Medical Department of the Navy, in order that the former may obtain an equally desirable class of young officers, and thereby maintain the standard of medical education for the military service.

The increase desired affords approximately the same proportion in each grade as is now enjoyed in the Navy, which is considerably less than that enjoyed by the Medical Corps of the Army for many years prior to 1901. In the reorganization of February 2d of that year, notwithstanding the recommendations of the Dodge Commission and of the Surgeon-General for an increased proportion of medical officers, that proportion was not only not increased but actually decreased. With a less number than is now asked for the Medical Corps can not properly perform the duties with which it is charged by regulations. With a less proportion in the higher grades it can not successfully compete with the naval service to fill vacancies created. The substitution of regular medical officers for contract surgeons is absolutely necessary for the efficiency of the Medical Department from every standpoint. It is earnestly hoped that favorable action by Congress may be had in the near future on the bill, the passage of which means so much to the Government and to the Medical Corps of the Army.

THE ARMY MEDICAL SCHOOL.

The last session of the Army Medical School began November 1, 1903, and ended April 5, 1904, with a class of 27 student officers, all of whom were assistant surgeons recently appointed in the Medical Corps of the Regular Army.

The personnel of the faculty during the eighth session was as follows:

Col. Charles L. Heizmann, assistant surgeon-general U. S. Army, president of the faculty and professor of military medicine.

Maj. William H. Arthur, surgeon, U. S. Army, instructor in the duties of medical officers.

Maj. William C. Borden, surgeon, U. S. Army, professor of military surgery and X-ray work.

Maj. Walter D. McCaw, surgeon, U. S. Army, professor of military hygiene and tropical diseases.

Maj. James D. Glennan, surgeon, U. S. Army, professor of ophthalmology and optometry.

Capt. F. P. Reynolds, assistant surgeon, U. S. Army, instructor in hospital-corps drill and medical department administration.

Capt. C. R. Darnall, assistant surgeon, U. S. Army, professor of sanitary chemistry and operative surgery.

Lieut. James Carroll, assistant surgeon, U. S. Army, professor of bacteriology and clinical microscopy.

In addition to the regular schedule of subjects, Brig. Gen. G. B. Davis, Judge-Advocate-General, U. S. Army, gave a course of most interesting lectures on military law, and one lecture was given on the library of the Surgeon-General's Office by Robert Fletcher, M. D., F. R. C. S., assistant librarian of the Surgeon-General's Office. Demonstrations in the management of the machines for producing X-rays and in taking and developing skiagraphs were given by Dr. W. M. Gray of the Army Medical Museum, under the direction of Major Borden.

The faculty agreed upon and arranged a schedule of subjects and rating for same for the determination of the proficiency of the student officers, as follows:

Hours.	Subject.	Rating.	
		Min.	Max.
100	Duties of medical officers, medical department administration, and customs of the service	700	1,000
20	Military hygiene	500	800
180	Clinical microscopy and bacteriology	500	800
20	Military surgery	490	780
15	Tropical medicine	420	600
120	Sanitary chemistry	420	600
60	Hospital corps drill	350	500
20	Operative surgery	280	400
30	Ophthalmology and optometry	280	400
	Department	280	400
9	Military medicine	210	300
20	X-ray work	210	300
40	Equitation	140	200
Total		4,900	7,000

In order to be rated proficient and receive a certificate a student officer had to obtain 4,900 points, or 70 per cent. Those who received 6,300 points (90 per cent) or over were rated as proficient with honor. It was announced that a student officer who obtained less than 70 per cent would not receive a certificate of proficiency.

The courses of lectures and laboratory instruction were completed as posted, excepting that of equitation. The instructor originally appointed, Capt. H. S. Trout, Second Cavalry, was relieved in December in order to accompany his regiment to the Philippines, and no one was assigned to take his place until January 25, 1904, when Capt. W. W. Whitside, Fifteenth Cavalry, resumed the instruction in riding. Owing to this interruption and the patent difference in the system of marking followed by these two officers and the difficulty of obtaining uniform ratings in this course under any circumstances, the faculty decided prior to the final examinations to strike out all marks on equitation, and, in order not to disturb the total, to add to deportment the maximum and minimum marks allowed for riding.

The best of discipline was maintained among the students throughout the session, a few trifling lapses in deportment having been reported by the instructors. All were assiduous in their studies, prompt in attendance, and conscientious in the performance of all prescribed duties, for it was primarily impressed upon them that every action

relative to the school would be looked upon by the authorities as one of duty.

Only one officer failed to reach the total minimum required, while the others attained points considerably above, six receiving 90 per cent or over, thereby being rated as proficient with honor.

It is the unanimous opinion of the faculty that the title "professor" be changed to "instructor" in order to conform to the custom of all other service schools.

The final examinations began March 21, 1904, upon completion of which the faculty determined the relative rating of the student officers and their final standing in the class.

"The Alexander H. Hoff memorial gold medal" was awarded to First Lieut. Lloyd L. Smith, assistant surgeon, U. S. Army, the other honor graduates being Lieutenants Vedder, Pipes, Miller, Siler, and Noble.

The closing exercises were held in the hall of the National Museum, April 5, 1904, and I desire to express the thanks of the faculty and the student officers to the Board of Regents for their courtesy in extending to us the privileges of the hall for the occasion.

The diplomas were presented by The Honorable The Secretary of War, the memorial medal by Lieut. Gen. Adna R. Chaffee, Chief of Staff, U. S. Army, and the address made by Prof. Charles A. L. Reed, M. D., president of the Pan-American Medical Association and ex-president of the American Medical Association.

The following is an outline of the plan, approved by the Secretary of War to take effect July 1, 1904, by which all candidates for commission in the Medical Corps of the Army may receive instruction as contract surgeons after examination and by which the final recommendations for commissions shall be contingent upon their successfully passing the examination of the school:

The examination for appointment as assistant surgeon in the Army will consist of two parts—a preliminary examination and a final or qualifying examination, as hereinafter described, with a course of instruction at the Army Medical School intervening.

Preliminary examination will be required as follows:

(a) Physical.

The physical examination must be thorough. Candidates who fall below 64 inches in height will be rejected. Each candidate is also required to certify "that he labors under no physical infirmity or disability which can interfere with the efficient discharge of any duty which may be required." Errors of refraction, when not excessive, and not accompanied by ocular disease, and when correctible by appropriate glasses, are not causes for rejection.

(b) Written examination on the following subjects:

Mathematics (arithmetic, algebra, and plane geometry), geography, history (especially of the United States), general literature, Latin grammar, and the reading of easy Latin prose; English grammar, orthography, and composition will be determined from the applicant's examination papers.

(c) Written examination on the following subjects:

Anatomy, physiology, chemistry and physics, materia medica and therapeutics, and normal histology.

The preliminary examinations will be conducted by boards of medical officers at the larger military stations in the United States by questions in the several subjects sent from this office. Formal invitations will be extended to eligible applicants to appear at the most convenient point at which a board is convened and a date will be fixed for such appearance, which will be uniform throughout the country. No allowances can be made for the expenses of applicants undergoing preliminary examinations.

Applicants who attain a general average of not less than 80 per cent in the preliminary examinations will be employed as contract surgeons and ordered to the Army Medical School in this city for instruction as candidates for admission to the Medical

Corps of the Army. If, however, a greater number of applicants attain the required average than can be accommodated at the school, the requisite number will be selected according to relative standing in the examination. An applicant thus selected will, prior to employment under contract, be required to make an agreement to accept commission as assistant surgeon if found qualified in final examination and that he will serve at least five years thereafter, unless sooner discharged. Contracts with candidates undergoing instruction at the Army Medical School will provide for pay at the rate of \$100 per month, without other compensation or allowances, except when traveling under orders, when the usual travel pay for officers will be allowed.

An applicant failing in one preliminary examination may be allowed another after the expiration of one year, but not a third. Withdrawal from examination during its progress, except because of sickness, will be deemed a failure.

The course of instruction at the Army Medical School will be of eight months' duration, commencing on the 1st of October next succeeding the preliminary examination; it will consist of lectures and practical work in such subjects as are peculiarly appropriate to the duties which a medical officer of the Army is ordinarily called upon to perform. During this course of instruction the candidates will be held under military discipline, and character, habits, and general deportment closely observed; if for any reason a candidate should be deemed undesirable his contract may at any time be annulled by the Surgeon-General.

At the close of the term of the Army Medical School all candidates will be subjected to a rigid physical examination and those found physically qualified will be admitted to the final or qualifying examination for admission to the Medical Corps; this examination will comprise the subjects taught in the school, together with surgery, practice of medicine, diseases of women and children, obstetrics, hygiene, bacteriology, and pathology. Candidates will also be marked in general aptitude as determined from their service at the school. Candidates claiming a knowledge of ancient or modern languages, higher mathematics, or scientific branches other than medical, may be examined in the same and due credit given in determining relative standing of those commissioned. The candidates standing highest in this examination who attain a general average of 80 per cent and upward will be selected for commission in the order of their standing to fill existing vacancies in the Medical Department. Candidates who attain the requisite general average of 80 per cent and upward who fail to receive commissions because of lack of vacancies will be given certificates of graduation at the school and will be preferred for selection for volunteer commissions and for employment as contract surgeons, and they will be given an opportunity to take the qualifying examination with the next succeeding class.

Applications for permission to appear for examination, prepared in accordance with requirements before mentioned, should be sent to the Surgeon-General, U. S. Army, and when completed will be filed in this office until the next succeeding preliminary examination shall have been decided upon, when formal invitations to appear before a board will be issued. Applicants are advised to file the necessary papers as early as practicable, in order that the places of examination may be arranged most conveniently to applicants, due regard being had to the interests and necessities of the service.

It is thought that this course will enable a better estimate to be made of the probable value of a young medical man for his future duties as a medical officer of the Army and thus have the assistant surgeon proficient in his military duties as administrator, sanitarian and officer of the Army at the time he is commissioned.

CONTRACT SURGEONS, U. S. ARMY.

There were 229 contract surgeons in service at the close of the fiscal year ended June 30, 1903. During the past fiscal year contracts were made with 37 physicians, while 82 contracts were annulled and 2 were terminated by death, leaving 182 in service June 30, 1904.

As in the preceding year, the new contracts made were usually with physicians who had already served as contract surgeons or as medical volunteer officers, and the greater number of these are still on duty in the Philippine Islands. The net loss in number of contract surgeons for the fiscal year was 47, and the number remaining in service is the lowest since July, 1898.

Contract Surg. Frank L. R. Tetamore was drowned off the coast of Tayabas, P. I., February 9, 1904; and Contract Surg. Thomas J. O'Reilly, died of tuberculous meningitis, at the general hospital, Fort Bayard, N. Mex., May 29, 1904.

CONTRACT DENTAL SURGEONS, U. S. ARMY.

Thirty contract dental surgeons are allowed by the act of Congress approved February 2, 1901, and this number has been continuously employed during the fiscal year ended June 30, 1904. One contract was annulled, and the vacancy thus created was filled the next day. Seventeen dental surgeons are at present serving in the Philippines Division and 13 in the United States.

The percentage of dental diseases and injuries in the Pacific Islands and China is 99.23, compared with 44.85 and 24.66, the respective percentages for the United States and Cuba and Porto Rico. The percentage of operations in each country approximates closely the relative proportions for disease and injury, being 105.87 for the Pacific Islands and China, 52.14 for the United States, and 23.38 for Cuba and Porto Rico.

The number of restorations of teeth by crowning and bridging and the number of artificial dentures shows a decided gain over the corresponding period last year. In 1902 restorations by bridges and crowns numbered 506, in 1903, 1,002; while in 1902 restorations by artificial dentures amounted to 146 and in the past year 314 are recorded. The whole number of dental caries treated was almost exactly the same as last year.

The following tabulated statistics showing the prevalence of dental caries and other dental and oral diseases among the troops, indicate the great amount of valuable work that is being done by the dental surgeons, and would also seem to show that sufficient care is not being exercised in the selection of recruits as far as concerns the condition of the teeth. Considering the great importance of the condition of the teeth in the proper mastication of the food and the prevention of digestive and intestinal disorders, and also that a diseased oral cavity opens the way to various infections, it would seem that the requirements for enlistment laid down in the manual, as regards the teeth, should be modified. At least eight sound opposing molars, two on each side in each jaw, should be required, and the condition of the other teeth as regards caries should be taken into account:

Diseases and injuries treated during the year ending June 30, 1904.

DISEASES AND INJURIES OF THE TEETH AND GUMS.

	United States (continental).	Pacific Islands and China.	Cuba and Porto Rico.	Total.
Abrasions, mechanical.....	6	19	.....	25
Abscess of the jaw, associated with impacted teeth.....	15	17	.....	32
Calcification of the pulp.....	3	2	.....	5
Cysts of the jaw, associated with devitalized teeth.....	.....	1	.....	1
Defective fillings.....	22	35	2	59
Dental caries.....	13,596	16,919	241	30,756
Dento-alveolar abscess.....	1,260	1,135	13	2,408
Devitalized pulp.....	768	1,060	.....	1,828
Dislocation of teeth.....	12	.....	.....	12
Erosion, chemical.....	14	13	.....	27
Erupting teeth, painful.....	41	17	.....	58
Fracture of the teeth.....	66	71	.....	137

Diseases and injuries treated during the year ending June 30, 1904—Continued.

DISEASES AND INJURIES OF THE TEETH AND GUMS—Continued.

	United States (continental).	Pacific Islands and China.	Cuba and Porto Rico.	Total.
Hemorrhage following extraction	5	.....	.....	5
Hypertrophy of the gums.....	9	42	.....	51
Hypertrophy of the pulp.....	5	8	.....	13
Hypercementosis .....	.....	5	.....	5
Impacted teeth	22	20	.....	42
Irregularities of the teeth.....	18	10	.....	28
Necrosis of the teeth	152	273	.....	425
Pericementitis:				
Acute	84	121	2	207
Chronic	64	57	3	124
Pulp nodules.....	.....	1	.....	1
Pulpitis:				
Acute	641	985	6	1,632
Chronic	240	516	23	779
Pyorrhea alveolaris.....	165	107	.....	272
Resorption of the alveolar process.....	18	25	.....	43
Recession of the gums	34	28	25	87
Salivary deposits.....	1,371	1,379	59	2,809
Sensitive dentine.....	22	1	.....	23
Supernumerary teeth.....	8	7	1	16
Others	94	461	2	557
Total.....	18,755	23,335	377	42,467

DISEASES AND INJURIES OF THE MOUTH AND JAWS.

Caries of the jaws.....	.....	2	.....	2
Empyema of the antrum (suppurative)	1	13	.....	14
Fracture of the alveolar process, superior	3	.....	.....	3
Fracture of the jaw, inferior.....	7	9	.....	16
Gingivitis:				
Simple	105	159	3	267
Ulcerative	18	12	1	31
Leucoplakia:				
Buccal .....	.....	1	.....	1
Lingual	1	1	.....	2
Mucous engorgement of the antrum.....	1	.....	.....	1
Necrosis of jaws:				
Superior	2	5	.....	7
Inferior	3	2	.....	5
Neuralgia, facial.....	6	10	.....	16
Periostitis.....	16	5	4	25
Stomatitis:				
Infectious.....	3	4	.....	7
Syphilitic	3	9	.....	12
Ulcerative	13	21	.....	34
Tumors of the gums:				
Superior	1	.....	.....	1
Inferior	2	.....	.....	2
Others	14	47	.....	61
Total	199	300	8	507

OPERATIONS ON THE TEETH AND GUMS.

Abscesses lanced.....	142	96	1	239
Excision of the gums.....	26	14	.....	40
Pulp:				
Capped	23	2	.....	25
Devitalized	729	1,994	5	2,728
Extirpated.....	821	1,529	2	2,352
Root canals filled with—				
Gold .....	.....	1	.....	1
Gutta-percha	964	1,166	.....	2,130
Oxychloride cement.....	17	79	.....	96
Salivary deposits removed.....	1,462	1,601	79	3,142
Teeth extracted	2,773	3,756	62	6,591
Teeth treated, medicated.....	2,744	2,881	17	5,642
Others	13	420	7	440
Total.....	9,734	13,539	173	23,446

Diseases and injuries treated during the year ending June 30—Continued.

OPERATIONS ON THE MOUTH AND JAWS.

	United States (continental).	Pacific Islands and China.	Cuba and Porto Rico.	Total.
Caries of the jaws.				
Superior		1		1
Inferior		1		1
Cleft palate—bony		1		1
Empyema of the antrum	3	5		8
Mucous engorgement of the antrum	1			1
Necrosis of the jaws:				
Superior		3		3
Inferior	1	1		2
Periostitis of the jaws, inferior		2		2
Tumors of the gums, inferior	1			1
Tumors of the jaws, inferior		1		1
Others	7	9		16
Total	13	24		37

RESTORATION OF THE TEETH BY FILLINGS.

Amalgam	7,428	5,644	51	13,123
Gold	1,187	906	13	2,106
Gutta-percha	275	386	2	663
Oxyphosphate	2,259	2,747	120	5,126
Others	23	13		36
Total	11,172	9,696	186	21,054

RESTORATIONS BY COMBINATION FILLINGS.

Gutta-percha and amalgam	130	79		209
Gutta-percha and oxyphosphate	82	287		349
Oxyphosphate and amalgam	236	908		1,189
Others	1	51		52
Total	449	1,300		1,749

RESTORATIONS BY BRIDGES AND CROWNS.

Bridges:				
Gold	29	76		105
Gold and porcelain	92	26		118
Reset	49	24	3	76
Others	4	16		20
Crowns:				
Gold shell	206	215	3	424
Logan	108	38		146
Richmond (gold and porcelain)	26	8		34
Reset	42	25		67
Others	5	7		12
Total	561	435	6	1,002

RESTORATIONS BY ARTIFICIAL DENTURES.

Aluminum, partial, vulcanite attachments	1			1
Gold, partial, vulcanite attachments	1	2		3
Vulcanite:				
Full	16	27		43
Partial	64	157		221
Broken plate repaired	15	31		46
Total	97	217		314

Diseases and injuries treated during the year ending June 30, 1904—Continued.

MECHANICAL APPLIANCES FOR FRACTURED JAWS.

	United States (continental).	Pacific Islands and China.	Cuba and Porto Rico.	Total.
Angle appliance.....	3	.....	.....	3
Gunning or Hayward splint, vulcanite.....	2	.....	.....	2
Kingsley splint, vulcanite, Marshall attachments.....	1	.....	.....	1
Metal splints.....	3	1	.....	4
Others.....	.....	4	.....	4
Total.....	9	5	.....	14

RECAPITULATION OF DISEASES AND OPERATIONS.

Mean strength of troops on duty during year 1903.....	42,264	23,818	1,561	67,643
Total diseases and injuries treated.....	18,964	23,635	385	42,974
Percentage.....	44.85	99.23	24.66	63.63
Total operations.....	22,085	25,216	365	47,616
Percentage.....	52.14	105.87	23.38	70.39

Summary of tables of susceptibility to dental caries in individual teeth of the United States Army as a whole.

Classification.	United States (continental).		Pacific Islands and China.		Cuba and Porto Rico.		Total.	
	Caries.	Per cent.	Caries.	Per cent.	Caries.	Per cent.	Caries.	Per cent.
Central incisors:								
Upper.....	1,121	8.24	1,381	8.16	31	12.86	2,533	8.24
Lower.....	65	.48	188	1.11	3	1.24	256	.83
Lateral incisors:								
Upper.....	925	6.80	1,119	6.61	30	12.45	2,074	6.74
Lower.....	68	.50	298	1.76	3	1.24	369	1.20
Cuspids:								
Upper.....	470	3.46	600	3.55	15	6.22	1,085	3.63
Lower.....	87	.64	412	2.44	.....	.....	499	1.62
First bicusps:								
Upper.....	1,096	8.06	1,434	8.48	13	5.39	2,543	8.27
Lower.....	268	1.97	415	2.45	3	1.24	686	2.23
Second bicusps:								
Upper.....	1,174	8.63	1,453	8.59	18	7.47	2,645	8.60
Lower.....	683	5.02	683	4.04	7	2.90	1,373	4.46
First molars:								
Upper.....	1,912	14.06	2,417	14.29	35	14.52	4,364	14.19
Lower.....	1,747	12.85	1,975	11.67	19	7.88	3,741	12.16
Second molars:								
Upper.....	1,321	9.72	1,594	9.42	21	8.71	2,936	9.55
Lower.....	1,648	12.12	1,744	10.31	23	9.54	3,415	11.10
Third molars:								
Upper.....	417	3.07	596	3.52	8	3.32	1,020	3.32
Lower.....	594	4.37	611	3.61	12	4.98	1,217	3.96
Total.....	13,596	.....	16,919	.....	241	.....	30,756	.....

SUMMARY.

	Number.	Per cent.
Upper.....	19,200	62.42
Lower.....	11,556	37.58
Total.....	30,756	.....
Right.....	15,412	50.11
Left.....	15,344	49.89
Total.....	30,756	.....

HOSPITAL CORPS.

At the date of last report, June 30, 1903, the strength of the hospital corps was as follows:

Sergeants, first class	279
Sergeants	313
Corporals	10
Privates, first class	1,668
Privates	762

Since then it has gained:

By enlistment	838
By transfer	455
Return from desertion	32

And lost during the same period:

By discharge by expiration of service	857
By discharge by order	120
By discharge by sentence of general court-martial	42
By discharge on surgeon's certificate	82
By transfer to line	9
By retirement	14
By death due to disease	14
By death due to suicide	3
By death due to drowning	2
By desertion	134

Leaving in service June 30, 1904:

Sergeants, first class	274
Sergeants	269
Corporals	19
Privates, first class	1,490
Privates	1,028

Sergeants, first class.—The vacancies existing in this grade June 30, 1903, and those occurring shortly thereafter were filled on August 1 of that year by the appointment of 31 sergeants who had received the highest marks in a competitive examination held in accordance with regulations.

During the year ended June 30, 1904, the hospital corps lost 38 sergeants, first class, as follows:

Discharged by expiration of service	14
Discharged by order	5
Discharged by sentence of court-martial	5
Discharged on surgeon's certificate	5
Died	3
Suicide	1
Deserted	1
Retired	4

To fill these vacancies a competitive examination was held from May 31 to June 6, 1904, simultaneously in all of the military departments located within the United States and in the Philippines Division.

Seventy-two applications were received from sergeants serving at posts within the United States to take this examination; of these, 5 were disapproved at this office for various reasons, 6 applicants withdrew from examination, 1 declined examination, and 1 failed to appear. Fifty-nine applicants completed the examination; of these, 8 were not recommended by the local board, 6 attained the percentage between 90 and 97.5, 21 a percentage between 80 and 89, 13 between 70 and 79, and 11 failed to attain a marking of 70 per cent.

In the Philippines Division 21 sergeants applied for examination for promotion, of whom 20 were approved and 1 disapproved. Eight of the applicants withdrew from the examination. Twelve of the applicants were fully examined and recommended for promotion by the local boards.

The proviso of the act of March 2, 1903 (appropriation for support of the Army), creating the grades of privates, first-class, and of privates, has proved entirely satisfactory in every way, and the experience of the past year has conclusively shown that this change has stimulated the men to attain the higher grade by conscientious theoretical study and a more thorough application of the knowledge by the daily routine work in the hospitals.

The numerous reports of the inspectors-general, special reports of commendation by line officers, and the granting of certificates of merit to many men of this corps are facts which strongly illustrate the general character of the men enlisted in the hospital corps.

Recruitment.—In the fall of 1903 it became apparent that recruits for the hospital corps would be urgently needed to supply the losses occurring during the next few months. The attending surgeons, at New York, Boston, Philadelphia, Chicago, and San Francisco were at once directed to make special efforts to secure enlistments, for the reason that the number of enlistments for the corps made by recruiting officers of the line was far below the demands. In April, 1904, these instructions were repeated to all attending surgeons, and special instructions were given to the attending surgeon in New York City to enlist all desirable men who may present themselves without referring each case to this office, yet the number of enlistments did not supply the losses. The terms of service of 682 men expire between January 1, 1904, and December 31, 1904, requiring the enlistment of 57 per month.

The total loss to the corps from all causes from July 1, 1903, to June 30, 1904, was about 1,277 men. The enlistments from civil life during the same period were only 519, and the additional men required were necessarily obtained by transfer from the line. Only 202 members of the corps reenlisted therein on the day following discharge. No serious results have, however, thus far arisen from this dearth of enlistments from civil life, nor is there any apprehension felt on that account so long as the deficiencies can be made up by transfer from the line. These fluctuations in enlistments are seemingly due to a variety of causes, which, however, are not of a permanent nature.

The distribution of the hospital corps at the date of this report is as follows:

Departments.	Sergeants, first class.	Sergeants.	Corporals.	Privates, first class.	Privates.	Total.
California.....	10	18	.....	56	27	111
Colorado.....	8	6	.....	26	35	77
Columbia.....	11	10	.....	36	42	97
Dakota.....	7	7	.....	38	40	92
East.....	37	38	.....	168	153	396
Gulf.....	10	13	.....	68	40	131
Lakes.....	7	9	.....	38	26	80
Missouri.....	14	17	2	104	73	210
Texas.....	10	10	.....	58	36	114
Independent.....	58	58	11	268	292	682
Total, United States.....	167	186	13	800	764	1,990

Departments.	Sergeants, first class.	Sergeants.	Corporals.	Privates, first class.	Privates.	Total.
Alaska.....	6	3	.....	20	8	37
Porto Rico.....	1	4	.....	14	6	25
Hawaii.....	1	2	.....	5	4	12
Philippines.....	90	74	6	561	242	973
Ordered to Philippine Islands.....	1	.....	.....	.....	.....	1
China.....	1	.....	.....	3	2	6
Transports.....	7	.....	.....	27	2	36
Total.....	274	269	19	1,490	1,028	3,080

The board of medical officers convened by Special Orders No. 104, War Department, May 4, 1903, to revise the Hospital Corps Drill Regulations; to submit schemes of instruction for detachments and companies of instruction, hospital corps, and to recommend a suitable knife for field service for members of the hospital corps, made its report in July, 1903. The knife recommended by this board has been approved by the Secretary of War and is now being manufactured by the Ordnance Department. It is believed that it will be a valuable addition to the present field equipment of members of the hospital corps.

The revision of the Drill Regulations and Outline for First Aid for the Hospital Corps is now in the hands of the Chief of Staff, and it is hoped will be published at an early date. The schemes of instruction for detachments of the hospital corps and companies of instruction, hospital corps, submitted by the board have been approved by the Secretary of War, and will be published in the Manual for the Medical Department when the board now revising the manual makes its report. In the meantime these schemes have been put in operation throughout the Army, so that they may have a practical test before their final adoption and publication.

Two companies of instruction for members of the hospital corps have continued in operation during the year—one at Washington Barracks and one at Fort McDowell.

Company of Instruction No. 1, Hospital Corps, at Washington Barracks, was used in connection with the general hospital to instruct the student officers of the Army Medical School in the various practical exercises of the company and in the administrative duties devolving upon them as members of the Medical Corps of the Army.

Capt. F. P. Reynolds, assistant surgeon, U. S. Army, commanding the company, reports as follows on the operations of the command during the year:

During the fiscal year 261 men were received in the company, of whom 225 were recruits and 36 were men with previous service in the hospital corps.

Transfers to other stations were as follows: Thirteen noncommissioned officers, 34 privates, first class; 204 privates, of whom 91 were transferred for foreign service. Twenty men were discharged for various causes; 5 members of the company were appointed sergeants, first class; 13 were appointed sergeants, and 6 were appointed corporals.

The character of the recruits received was below that which should be expected considering the advantages offered in the hospital corps. On joining many were found to have serious physical defects disqualifying them for service. Twelve were discharged for disability, of whom 11 were physically unfit at the time of enlistment. Seven men were discharged without honor because of bad character.

It is believed that if recruiting for the hospital corps were done by medical officers only, this large proportion of undesirable and defective men would not be enlisted, and that men of higher intelligence would be obtained.

The work of the year has been in accordance with the scheme for instruction of companies recently compiled by a board of medical officers and approved by the Surgeon-General and Chief of Staff.

The recently revised Hospital Corps Drill Regulations have been used by the company since August, 1903, the instruction in the drill being given in accordance with these regulations. Some minor defects were thus discovered and corrected and the practicability of the different movements proven.

Field service of the company.—The company again attended the encampment of the Pennsylvania National Guard, this year that of the Third Brigade at Mount Gretna, Pa. Leaving Washington July 1, the march of about 134 miles was made in about eight days. Returning, the route was through the Cumberland Valley to Hagerstown, the Antietam battlefield, Harpers Ferry, and Leesburg, Va., a total distance of 195 miles made in nine marching days. On five of these days marches of over 20 miles were made, on one day 29 miles were made, and on another 40 miles.

Besides the usual company field equipage and personal equipment of the men, a regimental hospital was carried. The transportation consisted of four wagons. One noncommissioned officer and two privates were mounted. A beautiful site was assigned for the camp at Mount Gretna, on which the regimental hospital was pitched, where it remained for exhibition and for purposes of instruction throughout the encampment. Drills covering setting-up exercises, the school of the soldier, the school of the detachment, litter drill, first aid, and field work were given in the presence of the medical officers and hospital corps of the brigade. An exhibition was also given before the Governor of the State and his staff.

At several of the drills of the hospital corps of the National Guard, noncommissioned officers of the company were present as instructors and assistants. The courtesy and hospitality shown to visiting officers and men make service with the Pennsylvania National Guard an experience long to be remembered. The advantages of combined encampments to both services are well understood, and for the regulars they are as important as for the militia. On the return march the company spent two days in camp with the National Guard of the District of Columbia at Leesburg, Va., where the regimental hospital also was shown. Here also many courtesies were extended to the company by the commanding-general, the surgeon-general, and officers of the District Guard.

On September 22, 1903, the company left Washington for West Point, Ky., taking with it the equipment of field hospital No. 1. The company established and manned this hospital during the maneuvers at this place and also furnished most of the noncommissioned officers and some of the men for the ambulance company and base hospital.

From Camp Young the company, on October 11, 1903, went to Fort Riley, Kans., arriving there October 12, at which place it performed duties similar to those at West Point, Ky., with the maneuver division, Camp Wm. Cary Sanger.

In the experience gained by the Medical Department from this field service, Company of Instruction No. 1 has largely shared. Nearly 100 privates have profited by it, most of whom have been transferred elsewhere.

The company has 16 noncommissioned officers who have become familiar with the duties liable to be required of them on active service. The equipment of a field hospital and ambulance company form part of the company property, and the company is prepared to take the field with a trained personnel of noncommissioned officers and privates first class.

The commanding officer, Capt. John S. Kulp, assistant surgeon, U. S. Army, of Company of Instruction No. 2, Hospital Corps, at Fort McDowell, Cal., reports as follows on the operations of the company during the year:

The second company of the hospital corps was organized by authority of the Secretary of War on September 21, 1902. Since that date 1,052 men have received instruction. The present schedule extends over a term of four months. It is subdivided into four periods, each of one month. Each day has seven periods of instruction, and there are examinations at the end of each month.

The personnel comprises 1 captain, 1 lieutenant, first sergeant, quartermaster-sergeant, 7 sergeants, 3 corporals, and 7 privates permanently detailed to carry on the work. In addition the average number under instruction for the last twelve months was 86.

For purposes of instruction the men are divided into five classes, each of which is in charge of a noncommissioned officer, who is responsible for the discipline, conduct, and efficiency of his class.

A course of typewriting for those of the graduating class able to profit by it has proved a success, and a special department of drill and discipline has also been organized during the year. The courses of instruction are as follows:

- | | |
|---|---|
| 1. Setting-up drill. | 11. Nursing. |
| 2. Care and management of cattle and horses. | 12. Pharmacy. |
| 3. Infantry, tent, litter, and ambulance drill. | 13. Clerical work. |
| 4. Elementary anatomy and physiology. | 14. Ward classes in medical and surgical nursing. |
| 5. Dictation. | 15. Diet cooking. |
| 6. First aid, practical and theoretical. | 16. Minor surgery. |
| 7. Bandaging. | 17. Ward management. |
| 8. Army Regulations. | 18. Hygiene. |
| 9. Articles of War. | 19. Soldierly efficiency. |
| 10. Materia medica. | 20. Typewriting. |

There is now a constant demand for the graduates of the company, requests being received from medical officers almost daily, and a San Francisco nursing bureau has a number in civil practice. Of the 1,052 men under instruction, 54 received the certificate of graduation, or 5.1 per cent. This year a larger proportion of the men were received directly from the recruiting stations, and it is believed that better results are obtained with them than with those who have already served a few months in the hospital corps. In accordance with paragraph 49 of the manual there are usually a number of casuals present with the company. These men not only benefit by the more rigid discipline and the instruction which they receive, but they do necessary police and fatigue work, leaving the time of the men in classes free for study and recitation. Last winter when casuals were no longer assigned, the instruction suffered in consequence.

The company sadly needs a permanent home. Experience has proved that unless barracks are assigned by the War Department, there can be no fixidity of occupation. Fort McDowell, because of local conditions beyond the control of the Medical Department, seems no longer a suitable station, and transfer to the Presidio is recommended.

Two officers can not do the work of the company, and also furnish medical attendance for a headquarters and five organizations. The result is as unfair to the post as it is to the Medical Department and the officers themselves.

Side arms are recommended for noncommissioned officers, not as weapons but as symbols of their position and authority. A suitable allowance of quarters for the sergeants first class would seem a matter of simple justice, but has not yet been obtained.

Companies of instruction are no longer on an experimental footing. They fulfill a definite and a necessary purpose. During the last year the Second Company weathered a period during which it was all but without the conditions necessary for existence. It has now an intelligent and conscientious personnel of noncommissioned officers, to whom great credit is due. It never has had a sufficient commissioned personnel, nor a permanent home. These are its most pressing needs, now that both the curriculum and the noncommissioned instructors have reached a satisfactory state. The work of the Second Company is believed to have had an effect on the whole hospital corps, and this effect is still in the direction of a higher standard of excellence.

EXHIBIT OF THE MEDICAL DEPARTMENT OF THE ARMY AT THE LOUISIANA PURCHASE CENTENNIAL EXPOSITION, ST. LOUIS, MO.

The exhibit which is in charge of Maj. Richard W. Johnson, surgeon, U. S. Army, consists of a field hospital having a capacity of 108 beds and is located just northeast of the Palace of Liberal Arts. The attractive display is composed of the improved hospital equipment and supplies as now furnished the Medical Department under existing regulations.

The hospital wards comprising 18 tents of the Munson pattern are arranged in the form of a square in front of which are the office, dispensary, and operating tents. In the rear of the wards are situated the mess, kitchen, and store tents, while on the right are quarters for

the commanding officer and on the left quarters for the noncommissioned officers and privates of the hospital corps.

The plot of ground assigned for the use of the Medical Department has been sodded, except where cinder walks have been constructed for necessary communication, thus adding to the appearance and attractiveness of the exhibit, which has received general commendation from visitors.

The detachment of hospital corps men on duty at the Exposition gives daily an exhibition drill in first aid to the wounded, litter drill, demonstrations of the various means of transporting wounded, tent pitching, and hospital establishment. These drills are very popular, and are attended by a large proportion of those who attend the Fair.

ARMY NURSE CORPS.

During the last fiscal year 312 graduate nurses have applied for admission to the corps. There have been 37 appointments (27 new, 10 having had previous service) and 36 discharges. On June 30, 1904, the corps was filled to its maximum strength, having 100 nurses on active duty, distributed as follows:

United States Army general hospital, Presidio of San Francisco, Cal	39
United States Army general hospital, Fort Bayard, N. Mex	15
First Reserve hospital, Manila, P. I.	34
Convalescent hospital, Corregidor Island, P. I.	4
Base hospital, Iloilo, P. I.	5
On detached duty at Zamboanga, P. I.	2
Home awaiting discharge	1

100

The increasing demand for nurses at the hospitals made it necessary to assign the work as dietist at the Hospital Corps Company of Instruction, Fort McDowell, Cal., to a nurse at large. It was formerly done by a member of the corps. There are at present five hospitals where trained nurses are on duty, two in the United States and three in the Philippine Islands.

The health of the corps has been uniformly good. There has been no case of serious illness and no death during the year.

For many reasons it seems that a more generous provision should be made for the subsistence of the nurses. The ration alone is wholly inadequate. Owing to the comparatively small number serving at any one place, the savings therefrom are too insignificant to create a fund which might otherwise be applied to the improvement of their mess. This is notably true in the Philippines, where the cost of living is high and the need of a generous diet is particularly important.

It also seems desirable that some inducement to remain in the corps should be offered the older and most highly efficient nurses. An increase in pay of 5 per cent for every three years of service would be in line with the procedure in other branches of the military establishment and attain the desired end at a trifling cost to the Government.

The nurses have shown themselves an efficient and dignified body of women. A medical officer commanding one of the large general hospitals writes: "I have nothing but praise for the nurses of the Army Nurse Corps who have come under my observation. They have done faithful and most valuable work, and their services have been of inestimable value to the Medical Department."

MEDICAL DEPARTMENT OF THE MILITIA.

Medical officers of the Army were on duty with the militia in the annual encampments in Pennsylvania, Ohio, and Texas.

Maj. Guy L. Edie, surgeon, U. S. Army, reported that the organization of the medical department and hospital corps of the State of Ohio follows closely that of the regular establishment; the equipment to be identical. There was, however, at that time great deficiency of necessary equipment. Each regiment had its own hospital, there being no brigade or division hospital. There were ambulances, but no ambulance company was organized. The State owns no hospital tents. The personnel of the medical department is excellent, and the earnestness and intelligence they showed was particularly gratifying. The hospital corps was well instructed. The general fitness as to age and physical qualification of the troops compare unfavorably with the Regular Army. The orders for the sanitary inspections of the camp were excellent. He made the following recommendations:

That no person be appointed as assistant surgeon unless he has been examined and approved by a board consisting of not less than three medical officers convened by the governor, and that the surgeons be appointed from the assistant surgeons after examination and approval by a similar board convened by the same authority. I believe also that the State should have a medical officer with suitable rank to perform the duties of medical purveyor or supply officer.

That a uniform programme be prescribed for the instruction of medical officers and hospital-corps detachments at their home stations and in camps.

That the methods and usages of the medical department, Ohio National Guard, follow or approximate as closely as possible those of the Regular Army, especially as to records and blank forms. It was noted that the morning report of sick and wounded, although modeled after that in use in the Regular Army, differed materially. The sentiments of the medical officers of the guard seem to be favorable as to compliance with sections 4, 5 and 7 of the militia act, 1903. Every facility for the freest inspection was given and criticism was invited. All kindly courtesies were extended to the representatives of the War Department.

It was a revelation and a pleasure to me to observe the spirit and zeal shown by the guard in its work through the whole time of the encampment. It would be difficult to have more earnest work done in any encampment.

Major Mason reported that the medical department of the Texas National Guard was based on the divisional organization of the line; there was one lieutenant-colonel, division surgeon, two majors, brigade surgeons, and about seventeen other medical officers of various ranks attached to regiments. Of these, only the division surgeon and six regimental surgeons were present in camp up to the evening of the second day. The surgeon-general (who was also present in camp) had no roster of his corps until the day before the encampment, and there was no system of reporting the arrival of medical officers in camp. It appeared that medical officers could accompany the troops or stay at home, as suited their convenience.

There was no equipment of any sort. On request, the chief quartermaster bought what medicines and dressings were deemed necessary and returned to the drug stores the unexpended balance when the camp was over.

There was no organization or equipment of the hospital corps. A few hospital stewards were attached to some of the regiments, but the chief medical officer had no roster of them and did not know how many or who they were.

He recommended the transfer of 150 men to the hospital corps and the following organization of the medical department:

	Colo- nels.	Lieuten- ant-colo- nels.	Ma- jors.	Cap- tains.	Lieuten- ants.	Ser- geants, first class.	Ser- geants.	Pri- vates, first class.	Pri- vates.
4 regiments infantry			4	4	4	4	8	24	12
1 squadron cavalry				1			1		2
1 battalion artillery					4		4	4	4
1 field hospital			1	1	1	2	1	20	5
1 ambulance company			1	1	1	2	8	28	15
Administration:									
Surgeon-general's office	1			1		1		1	
Division surgeon's office		1				1		1	
Brigade surgeon's office			2				2		2
Medical supply depot				1			1	2	
Total	1	1	8	9	10	10	20	80	40

The transfer of the men was ordered and the organization adopted, but up to the time of his departure nothing had been actually accomplished and the organization was only on paper. He later learned that some fifty men were transferred and reported for duty with the corps.

Requisition was made under his direction for equipment and supplies for the regimental and brigade field hospitals and for the ambulance company. The plan was to procure the equipment before the next encampment and have it stored in Austin, under charge of the medical supply officer. He also recommended that after the close of the present encampment a field hospital and an ambulance company be organized in each of the two largest cities, to be officered by the medical officers there resident, and to be given regular drill and inspection throughout the year, this in addition to the regimental and smaller detachments. It was believed that an organization of this sort would hold together and encourage esprit de corps.

HOSPITAL CONSTRUCTION AND REPAIR.

During the fiscal year modern hospitals were built at Fort Greble, R. I.; Fort Rosecrans, Cal.; Fort Des Moines, Iowa; Fort Lincoln, N. Dak.; Fort Baker, Cal.; Fort Worden, Wash., and Fort Casey, Wash.

A modern operating room has been completed in connection with the United States Army general hospital, Presidio of San Francisco, Cal.; the hospitals in the Philippine Islands have been added to and repaired, and portable buildings have been purchased for use as officers' quarters at the United States Army general hospital, Fort Bayard, N. Mex., and minor repairs and improvements have been made to the hospitals at military posts.

Plans and specifications have been prepared for new hospitals at Fort Mott, N. J.; Whipple Barracks, Ariz.; Fort Bliss, Tex.; Fort Fremont, S. C.; Fort McDowell, Cal.; Fort Totten, N. Y., and a hospital for recruits and casualties at Angel Island, Cal., also for additions to the hospitals at Chickamauga Park, Ga.; Fort Ethan Allen, Vt.; Fort Meade, S. Dak.; Fort Robinson, Nebr.; Fort Wadsworth, N. Y.; Fort Slocum, N. Y.; Fort Myer, Va.; Fort Monroe, Va.; Fort Washington, Md.; Fort McKinley, Me., and for a dead house for the hospital at Fort Snelling, Minn.; also for a guardhouse for the United States

Army general hospital, Presidio of San Francisco, Cal. Some of these structures are now in course of erection and proposals are being invited for others.

Owing to the limitation fixed by section 1136 of the Revised Statutes, it was found impossible to erect modern hospitals at Whipple Barracks, Ariz., or Fort Mackenzie, Wyo. This statute was enacted March 3, 1859, when conditions were vastly different. To meet present demands it is not practicable to erect a modern and sanitary hospital for twelve patients, thoroughly equipped, for \$20,000. At the most accessible posts proposals have to be invited several times, and essential portions of the building have to be omitted before contracts can be entered into. This method causes delay, and not only involves the cost of changing the plans and specifications and readvertising, but requires an additional outlay for installing the omitted portions at a greater expense, which procedure is neither economical nor advantageous to the Government. It is recommended that section 1136 of the Revised Statutes be amended to read "fifty thousand dollars" instead of "twenty thousand dollars," in order to overcome the increased cost of material and labor since the enactment of the law in 1859.

It may be possible to erect a small hospital for 12 beds in one locality for \$25,000, while in another section of the country the same building would cost over \$30,000, the advance being due to the isolated situation, entailing an extra cost for transportation and lack of competition. These small hospitals, in addition to a ward of 12 patients, furnish quarters for 8 attendants, and are provided with an office, dispensary, mess room, kitchen, laboratory, operating room, instrument room, isolation ward, officers' ward, ward master's room, room for patients' effects, linen room, a dark room for the examination of the eyes, etc., lavatories, storerooms, boiler room and fuel room, all of which are necessary. The cost of erecting larger hospitals is less in proportion to size.

Preliminary sketches have been made for a new hospital at Fort Riley, Kans., and for enlarging the hospitals at Fort Leavenworth, Kans., Fort Sheridan, Ill., and Fort Snelling, Minn., for which purposes special appropriations were made by Congress at the last session. The money allowed for these purposes is entirely inadequate and will only partially meet the requirements, and unless additional appropriations are made it will take at least five or six years to place these buildings in a proper condition to meet the needs of these large posts, and the expense will be at least 20 per cent greater than if the structures were completed under one contract instead of being confined within the limit of the statutes.

New quarters for sergeants, first class, hospital corps, have been completed at Plattsburg Barracks, N. Y., Fort Wadsworth, N. Y., and Fort Williams, Me., and quarters are now in course of erection at Fort Stevens, Oreg. The quarters at Fort Howard, Md., Fort Morgan, Ala., and Fort Greble, R. I., have been enlarged, and minor repairs made to similar quarters at posts. Owing to the increased cost of material and labor it is not possible to meet all requirements from the appropriations authorized, and larger amounts will be necessary to meet the growing demands.

MEDICAL AND HOSPITAL SUPPLIES.

During the fiscal year covered by this report the various articles of field equipment contracted for during the preceding year, with one exception, have been all delivered. The time required to procure the field chests well illustrates the necessity of having field equipment on hand instead of postponing its purchase until war is imminent. The circulars of advertisement were dated February 2, 1903, and the bids were opened March 5. The following tabular statement shows the length of time required to obtain some of the more important articles:

Article.	No.	Date of contract.	Date of delivery.	Time.
				<i>Yr. mos. dys.</i>
Detached service chests	450	June 12, 1903	Apr. 28, 1904	10 16
Medical chests	150	do	Apr. 29, 1904	10 17
Sterilizer chests	120	do	do	10 17
Surgical chests	150	do	July 1, 1904	1 0 19
Emergency cases	1,125	do	May 14, 1904	11 2
Field operating cases, small	975	do	June 8, 1904	11 21
Orderly pouches	1,250	do	May 28, 1904	11 16
Hospital Corps pouches	9,000	May 29, 1903	Not completed.	.. .. .

The issue of field equipment to the organized militia under the act approved January 21, 1903, has been very considerable, as shown by the following table, and has to that extent reduced the stock of field equipment on hand. This will be replaced as far as practicable by new purchases. In order, however, to use advantageously the money refunded for this equipment under the act approved March 2, 1903, it should be made available until it is expended instead of ceasing to be available at the end of the fiscal year.

State.	Amount.	State.	Amount.
Alabama	\$398.55	Nebraska	\$664.88
California	1,177.03	New Jersey	276.82
Colorado	3,398.84	New Mexico	292.10
Connecticut	1,046.49	New York	978.14
Delaware	1,133.70	North Carolina	3,396.72
Florida	835.94	North Dakota	226.92
Hawaii	1,134.66	Ohio	6,554.58
Idaho	88.55	Oklahoma	1,141.95
Iowa	1,583.49	Texas	2,416.34
Kansas	2,304.06	Utah	788.49
Kentucky	1,207.73	Virginia	1,705.68
Maryland	3,951.87	Washington	1,316.54
Massachusetts	341.15	Wisconsin	3,987.91
Michigan	4,959.92		
Minnesota	1,661.24	Total	68,820.74
Missouri	4,945.95		

Three new field hospitals have been assembled during the year. The distribution of field hospitals is at present as follows:

Field hospital No. 1, with Hospital Corps Company of Instruction No. 1, at Washington Barracks, D. C.

Field hospital No. 3, at Fort Riley, Kans., where it is stored for use in maneuvers.

Field hospitals Nos. 2 and 4, in field medical supply depot, Washington, D. C.

Field hospital, No. 5, in medical supply depot, San Francisco, Cal.

The question of storage of field equipment has become a serious one. The three supply depots for current issues have not room to spare for

the accumulation and storage of reserve equipment for war, and to use for this purpose buildings for which city rentals must be paid is a manifest extravagance. The field depot in the basement of the Army Medical Museum building is of small capacity and may at any time be demanded for other uses. Several medical storehouses of fireproof construction on Government reservations at convenient locations should be provided for field equipment. A suitable building at the St. Louis powder depot recently turned over to the Quartermaster's Department, has been promised to the Medical Department for this use by the Quartermaster-General.

Nineteen regimental field hospitals, complete in every respect, have been issued to posts in the United States under paragraph 59, Manual for the Medical Department. A list of the posts so equipped is given in General Orders 75, War Department, December 31, 1903.

In the assembling of the reserve medicines for field hospitals listed in paragraph 289, Medical Manual, the Munson packing units have been used. The three months' supply for each hospital is arranged in three identical sets of boxes, each of which contains one-third or one month's supply of each drug. These sets are marked A, B, and C, and the boxes in each set are numbered consecutively from 1 to 16, of which there are seven containing drugs, two antiseptics, and seven hospital stores, including alcohol. Some slight changes in the amounts were necessary to make them divisible by 3. It has been found in practice that the packing unit has to be increased slightly from its theoretical dimensions. Its exact dimensions in the liter cartons are $8\frac{1}{2}$ by $6\frac{1}{4}$ by $6\frac{1}{4}$ inches, and the inside measurements of the 10 unit packing boxes used at the field supply depot, are $31\frac{1}{2}$ by $12\frac{1}{2}$ by $8\frac{1}{2}$ inches. These are of three-fourths inch stuff, iron bound and without end cleats, and 32 of them placed on end are exactly contained in the bed of a 4-mule army wagon.

The following are the medical supply depots:

Location.	Officer in charge.	Number of posts and stations supplied.
New York City, N. Y., 391 Washington street.	Lieut. Col. H. S. Turrill, deputy surgeon-general, U. S. Army.	69
St. Louis, Mo., 204 South Eighth street ^a	Lieut. Col. L. W. Crampton, deputy surgeon-general, U. S. Army.	39
San Francisco, Cal., 655 Mission street	Maj. Louis Brechemin, surgeon, U. S. Army.	34
Manila, P. I., Calle Concepcion	Maj. W. O. Owen, surgeon, U. S. Army	120
Field depot, Army Medical Museum and Library building, 7th and B streets, SW., Washington, D. C.	Capt. C. E. Darnall, assistant surgeon, U. S. Army.	(b)

^aThis depot also has on hand and issues field equipment.

^bField equipment for Army and organized militia.

The New York depot continues, as heretofore, to be the main purchasing depot, but care has been taken not to purchase in New York supplies for issue at western posts where New York prices plus the transportation charges equal or exceed the bids received at St. Louis.

The stores in the San Francisco depot which were returned from the Philippines have been largely drawn upon during the year for current issues.

Coil X-ray machines of the most improved pattern have been furnished to the United States Army general hospital, Fort Bayard,

N. Mex.; Cadet Hospital, West Point, N. Y.; United States Army general hospital, Presidio of San Francisco, Cal., and Fort Myer, Va.

Ice machines at 14 posts in the United States were turned over to the Quartermaster's Department at the end of the fiscal year, in accordance with recommendations from this office.

MANEUVERS.

The maneuvers of the year have given an excellent opportunity for the instruction of the Medical and Hospital Corps personnel in their duties in the field and for trial of the new medical field equipment.

The first maneuvers in point of time were those between the Army and Navy held in Portland, Me., for these troops began to assemble in May, though the actual maneuvers did not take place until the last of August.

Careful preparations for the sanitation of the maneuver camps and for the care of their sick were made on recommendations of Col. Henry Lippincott, assistant surgeon-general, U. S. Army, chief surgeon Department of the East, whose preliminary arrangements, described in the following report, are considered a model for future field exercises of the same character:

On March 30, 1903, seven companies of coast artillery were ordered from the vicinity of Boston, New York, and Baltimore, to the artillery district of Portland for duty in the maneuvers to be held in that district, the order requiring them to be at their destination on May 15. These troops were augmented by additional organizations ordered to arrive as follows: Nine companies coast artillery, June 1; one company of engineers, July 15; two batteries of field artillery, August 10. The following National Guard troops were also ordered to participate during the period of the actual maneuvers, August 22 to 29: Two regiments of infantry National Guard State of Maine, one regiment of heavy artillery Massachusetts Volunteer Militia, and two signal corps companies State of New York.

Immediately on receipt of official information relative to the maneuvers, recommendation was made by the chief surgeon to the department commander that odorless excavating apparatus, with closet and urinal troughs complete in every detail, be supplied to the posts of Fort McKinley and Fort Levett, where the troops were to go into camp, and that the purchase of material and hire of labor for the erection at these posts of a sufficient number of temporary latrines, according to specifications given in General Orders 170 of 1899, be authorized, sites for same to be selected by the officers on the ground, one of whom should be a medical officer. On April 25 three odorless excavators and 68 closet and urinal troughs were ordered shipped from the depot at St. Asaph, Va., by the Quartermaster-General.

On April 10 the Secretary of War approved a recommendation of the chief surgeon that toilet paper be issued for the use of the enlisted men at Forts McKinley and Levett in the quantities authorized by paragraph 1403, Army Regulations. This recommendation was made with a view to prevent the clogging and obstruction of the pipes connected with the excavating apparatus.

Recommendation was made March 28 that camp equipage supplied by the Quartermaster's Department be furnished as follows: For Fort McKinley, 6 hospital tents, 2 wall tents, and 4 common tents; 2 field ranges, small; 5 tent stoves and the other articles of field equipment enumerated in paragraph 325 of the Manual, except ambulances and harness, mounts for the hospital corps, camp colors, etc. The same equipage was recommended for Fort Levett less 1 hospital tent, 1 common tent, and tent stove. The number of tent pins recommended and supplied was largely in excess of the allowance given in the Manual. The flooring of these tents was recommended, but only the tents used as hospital wards for patients were floored. All these articles, except mauls which were disapproved by the department commander, were furnished. For the hospital corps detachments at each of the maneuver camps one conical wall tent was asked for and supplied.

On April 1 recommendation was made by the chief surgeon that Maj. Charles B. Ewing, surgeon, U. S. Army, be directed to make a preliminary investigation into the sanitary and hygienic conditions at Forts McKinley and Levett, with a view to recommending to the district commander the selection of sites for the camps and all

their appurtenances, including hospital, cook, and mess tents, latrines, and all other matters, especially the water supply, pertaining to the sanitary and hygienic welfare of the troops to be encamped at these posts during the maneuvers.

Major Ewing in his report of inspection recommended that temporary frame quarters used for barracks at Fort McKinley and a frame cottage at Fort Levett, owned by the Government, be set aside as temporary hospitals for the accommodation of the sick to be maintained in conjunction with the tent hospitals, which he suggested be used for convalescents and hospital corps men. This was authorized by the department commander. Major Ewing reported fully concerning the camp sites, water supply, etc., and stated that sites for the latrines had been so selected that roadways made available the odorless excavators. He recommended frame cook houses instead of cook tents. Board sheds were approved by the department commander for cooking purposes.

The chief surgeon recommended that the sanitary latrines and all cook and mess tents be screened with wire netting, and that the cook and mess tents be framed and floored. The screening of the latrines and mess tents was disapproved by the department commander, who, however, authorized the construction of 18 cook houses and two bakeries of frame, and the screening of windows and doors of same. Lumber for tent floors was not approved by the department commander, who desired that the troops should live as if in camp.

The regimental field hospital outfits at Fort Columbus and Plattsburg Barracks were ordered sent to Forts McKinley and Levett, respectively.

The chief surgeon requested authority, which was granted, to order necessary supplies direct from the New York depot, for posts participating in the maneuvers, without reference to the office of the Surgeon-General.

On April 18 the assignment of an assistant surgeon, with rank of captain, to duty at each of the maneuver camps was recommended with a view of having them arrive there as soon as possible after May 1, in order to arrange for the reception of the possible sick, make requisition for medical supplies, and look after sanitary and hygienic matters in advance of the arrival of troops.

A liberal allowance of lime for use in connection with the sanitary latrines at Forts McKinley and Levett, and also for possible contingencies at Forts Preble and Williams, was recommended to be furnished by the Quartermaster's Department, as well as mineral oil for the destruction of mosquitoes and their larvæ. Authority was granted by the department commander to purchase 125 barrels of lime and about 7 or 8 barrels of mineral oil for such purposes.

Recommendation was then made for hospital corps details to report on or about May 1, the allowance of army regulations based on the strength of the troops being followed as nearly as possible. Instructed men only were ordered sent. Litters were ordered taken when two or more men went from the same post.

Requisitions for an outfit of supplies for the camp hospitals, supplementary to the field hospitals, were prepared by the chief surgeon and referred to the medical supply officer at New York for issue.

The surgeons at the maneuver camps were informed of what had been done and a copy of every recommendation made was furnished the Surgeon-General.

Recommendation was made that the surgeons of posts from which troops were ordered to the maneuvers be instructed to furnish company commanders concerned with a certificate to the effect that so far as it was possible to ascertain there were no cases of typhoid or other epidemic infectious diseases among the men of the command. Instructions were given accordingly by the department commander.

The surgeons of the maneuver camps were furnished blank forms for the efficiency report of the hospital-corps detachments, and were informed it was desired that every advantage be taken of the opportunities for instructing them in the duties of the hospital corps in the field.

A small amount of hospital fund for the purchase of ice and articles of diet for the sick at the maneuver camps was furnished by the Surgeon-General.

Additional details of medical officers and hospital-corps men were recommended as the troops in the maneuver district were increased.

During the actual maneuvers medical officers were on duty at the several posts and camps as follows: Fort McKinley, 2; Fort Levett, 1; Fort Preble, 2; Fort Williams, 2; Cape Elizabeth, 1; Fort Gorges, 1; Camp Smith, L. I., 1.

The aggregate number of hospital-corps men in the maneuver district was 12 noncommissioned officers and 53 privates of both grades, divided among the posts as follows: Fort McKinley, strength of command, 918, 3 noncommissioned officers and 15 privates; Fort Levett, strength of command, 846, 2 noncommissioned officers and 8 privates; Fort Preble, strength of command, 606, 2 noncommissioned officers and 11 privates; Fort Williams, strength of command, 455, 2 noncommissioned officers and

11 privates; Camp Smith, L. I., 1 noncommissioned officer and 4 privates; Cape Elizabeth, strength of command, 200, 1 noncommissioned officer and 3 privates; Fort Gorges, strength of command, 158, 1 noncommissioned officer and 1 private.

The experience of the year before at Fishers Island during the maneuvers had been a disastrous one so far as typhoid fever was concerned, 57 cases of that disease having appeared among the troops encamped there, and it is a pleasure to record that Colonel Lippincott's efforts, seconded as they were by the medical officers participating in the exercises, were completely successful in preventing a repetition of that unfortunate occurrence, which proved, if further proof were needed in the light of what should have been learned from the Spanish-American war, that permanent camps will not remain healthy with makeshift sanitary arrangements improvised by the troops occupying them. The hearty cooperation of all line officers with the medical department in every detail of sanitary police was in marked contrast to the passive opposition often encountered formerly, and indicated a praiseworthy progress which promises well for the health of future camps. The Reed sanitary latrine again demonstrated its value. It may now be safely stated that in the absence of sewers it should be the only method considered for permanent camps.

A noteworthy point in the climatology at Portland, observed by Capt. George D. De Shon, assistant surgeon, U. S. Army, was the absence of the anopheles variety of mosquito. As stated by that officer, although the companies of artillery from southern stations brought a number of cases of malaria, these responded readily to treatment. No new infection occurred, and after a few weeks the disease completely disappeared. The air of the sea and the pines is an excellent tonic, and the general health of the command was much improved during this tour of duty. Captain De Shon makes the pertinent suggestion that the coast of Maine would be an admirable situation for a summer camp for convalescents or for troops debilitated by tropical service.

So far as the sanitation of the camps and the care of the sick were concerned the duties of the medical department were very successfully performed. The health of the commands at Forts McKinley and Levett was unusually good. The percentage of constant noneffective at Fort McKinley from May to September, which practically comprised the whole maneuver period, was 1.47, while that of Fort Levett for the same period was 1.98. There was no case of typhoid fever reported during the maneuvers.

The second important question which the Medical Department attempted to solve was the special duties likely to devolve upon it at seacoast fortifications during actual engagements, and the instruction which should be given medical officers and hospital corps in order to fit them to play their part during active service.

At both Forts McKinley and Levett instruction was of an entirely practical character. At Fort McKinley the detachment was divided into permanent litter squads, each under a noncommissioned officer. One squad was kept on duty at the hospital continuously for twenty-four hours, ready to respond to any emergency call during that period. Impromptu summonses were made by the surgeon at various hours during the day and night, and the squad required to proceed, somewhat after the method of Metropolitan firemen, to the designated battery, search for a wounded man, apply a primary dressing, and bring him in. From the most apt pupils an operating-room squad was selected.

These men were required to disinfect the room and prepare it as if for an operation. They learned the names of the few simple instruments and how to sterilize them. They prepared a few simple dressings. They learned how to wash their own hands and care for their own finger nails. When a dummy patient was brought in they undressed him, bathed him, shaved and scrubbed the parts supposed to be wounded, and prepared him for operation. These processes were gone through with in detail often enough so that the whole could be done with but little confusion. The interest taken by the men in this practical work as soon as they understood it, the rivalry of the different squads, and the zeal of the junior medical officers, were very gratifying.

At Fort Levett as soon as the camp was established all hospital-corps men were taught in the operating room. When they had become fairly proficient there each man was assigned to a place at the batteries or hospital and frequent practice in the performance of their duties was given, advantage being taken of all calls to arms.

On June 28, 1903, a board of officers consisting of the two surgeons on duty at the camp was convened by the camp commander to formulate an experimental scheme for the care of wounded during an artillery action. This board carefully considered the general problem of seacoast fortifications and the special conditions to be met at Fort Levett, working out the details with the available personnel and also with the personnel required under service conditions, which was found to be much larger than the regulation allowance based on the number of companies, as at a seacoast fort the character of the armament and the location of the batteries must determine this. A scheme of instruction for the hospital corps and the coast artillery was also devised and adopted, and both were thoroughly drilled in their duties.

Before the maneuvers 1 surgeon was ordered away from Fort Levett. The battalion of Maine National Guard brought 1 surgeon and 2 hospital corps privates, 4 men afterwards being detailed from the troops for duty with the medical department; the Massachusetts regiment, 1 surgeon and 1 hospital steward. Thus but three officers and 17 men were available for duty during the actual maneuver period, instead of 6 officers and 37 men, the numbers required as determined by the board.

On account of the great shortage of personnel it was not possible to carry out the recommendations of the board and the men were stationed at the hospital and at points of greatest danger in case of accidents.

During the fire of heavy guns two lessons were learned: First, that it will be impossible during an actual engagement to render any medical or surgical assistance on the parapet where all consideration must be sacrificed to efficient service to the guns. Wounded men will be in the way of the cannoneers and must be removed without delay. Litters can not be used because they will collide with the swiftly moving projectile trucks and ammunition hoists. A casemate room should be set aside for first-aid work. It should be connected by telephone with all parts of the battery. A detail of the hospital corps should be stationed in this room ready to run at call to any part of the battery and remove the wounded without ceremony, without delay and most of all without interfering with the movements of the cannoneers. Second, casemates can only be used for application of primary dress-

ing and for the most imperative operations. The discharge of the guns above causes so much vibration and so much dust from the cemented ceiling as to interfere with the successful performance of any delicate surgery.

While, as may be seen, the Medical Department profited to a considerable extent from these maneuvers, it is nevertheless true that they have not yet been utilized to nearly their capacity in that direction. In order that more may be accomplished in future it is primarily necessary that the Medical Department be organized for them under service conditions and that the modified peace organization which has obtained in the past be abandoned.

With this end in view a chief surgeon should be detailed with the same powers as a division surgeon. This officer should be ordered to the maneuver ground sufficiently early so that he may give his opinion on all the sanitary questions in connection with the camps and may formulate a scheme for the participation of the medical and hospital corps personnel to the best advantage.

By doing this it is thought that not only will the health of the troops be better safe-guarded, but a working scheme for each harbor may be elaborated so that in the event of war it will only be necessary to furnish personnel and supplies to put the medical service in operation without confusion or delay.

Army maneuvers were held during the year both at West Point, Ky., and Fort Riley, Kans.

Maj. Henry P. Birmingham, surgeon, U. S. Army, who was detailed as chief surgeon of the former, was not able to arrive on the ground until one week before the encampment, which, he reports, seriously handicapped the work of the Medical Department, as the arrangements made prior to that time were inadequate. He makes the pertinent recommendation that the officer selected for such work should be designated by the Surgeon General and, if possible, be given ample time to make all necessary arrangements and consult with the other staff officers, under direction of the military commander, so that timely action may be taken.

Major Birmingham, in his report, dated Washington Barracks, D. C., December 21, 1903, says in part:

The camp was opened on September 26, 1903, by the arrival of the regular troops, and the strength of the division and the percentage of sick during the encampment were as follows:

Average strength of regular troops.....	2, 631. 14
Percentage sick	2. 10
Average strength of militia troops.....	7, 567. 87
Percentage sick	1. 08
Total percentage sick	1.59

The apparent discrepancy in the percentage of sick between the regular and militia troops was due to two causes: First and most important, the failure on the part of the militia organizations to make proper record and render reports of their sick. Second, the greater length of stay in camp of the regular troops. The total percentage of sick, making due allowance for cases not reported, could not have exceeded 2.5 (and these for the most part were of a trivial nature), which is a most satisfactory showing.

Communications have been sent to the chief surgeons of the organized militia and to the surgeons of the regular troops participating in the encampment with a view of ascertaining if there has been any development of typhoid fever among the men of the command to which they belonged. Reports have been received from the home stations of all the regular troops participating in the encampment, and no typhoid

fever has appeared among the men. The reports, as far as received from the organized militia, show no typhoid fever in their commands, and as the same conditions obtained in both in a general way—at least as far as their water supply was concerned—it is safe to presume that like results in the matter of typhoid fever would also obtain. This, on the whole, is very gratifying, for, as we know, the one dread menace to troops assembled in home camps is typhoid fever.

The Medical Department personnel on duty with the brigades consisted of the following officers and enlisted men:

First Brigade.—Headquarters, band and 9 companies First U. S. Infantry; headquarters, band and 11 companies Third U. S. Infantry; battalion headquarters and 4 companies Twentieth U. S. Infantry; headquarters, band and 12 companies First Infantry, Wisconsin Organized Militia.

	Regular Army.	Militia.
Medical officers	4	3
Contract surgeon	1	.....
Enlisted men	20	15

Second Brigade.—First, Second, and Third Infantry, Indiana Organized Militia.

	Regular Army.	Militia.
Medical officers		7
Enlisted men		24

Third Brigade.—First, Second, and Third Infantry, Michigan Organized Militia; First Independent Battalion Infantry, Michigan Organized Militia.

	Militia.
Medical officers	10
Enlisted men	36

Fourth Brigade.—Second Infantry, Kentucky Organized Militia; Third Infantry, Kentucky Organized Militia; headquarters and 3 batteries Artillery Battalion, Kentucky Organized Militia; Eighth Infantry, Ohio Organized Militia.

	Regular Army.	Militia.
Medical officers	1	10
Enlisted men	2	85

Cavalry Brigade.—Two troops Second U. S. Cavalry; 2 troops Fourth U. S. Cavalry; band and 8 troops Seventh U. S. Cavalry; band and 4 troops Eighth U. S. Cavalry.

	Regular Army.
Medical officers	3
Contract surgeon	1
Enlisted men	11

Divisional Artillery.—Fourteenth Battery, U. S. Field Artillery; Twenty-first Battery, U. S. Field Artillery; First Battery, Indiana Organized Militia.

	Regular Army.
Medical officer	1

Field Hospital No 1.

	Regular Army.	Militia.
Medical officers	3	.....
Enlisted men	45	11

This organization, under the command of Capt. F. P. Reynolds, assistant surgeon, U. S. Army, arrived in camp from Washington Barracks, D. C., September 23, 1903, at 4 p. m., and the next morning was ready for the reception of patients. The field hospital was an object lesson to all in camp interested in the medical side of the maneuvers, and received high commendation from the foreign attaches, Colonels Raspopoff and Foster, who made a close inspection of the workings of the entire medical department.

The field hospital, minus its reserve supplies, was packed up and moved to Stith-ton (8 miles from camp), the base of the Brown Army in the maneuver of October 8, 1903, and used as a field hospital for the reception of wounded in this maneuver. Four ambulance loads of tagged patients, supposed to need hospital treatment, were received, treated, and properly recorded. The work of Captain Reynolds and his assistants, Lieuts. Charles R. Reynolds and Frederick A. Dale, assistant surgeons, U. S. Army, is to be highly commended.

The report of Capt. F. P. Reynolds on field hospital No. 1, hereto appended, is deserving of especial attention. The organization which Captain Reynolds was enabled to bring to the maneuvers was of incalculable benefit to the whole medical department present, for he had not only men for his field hospital, but through the men of the company of instruction, which he brought from Washington Barracks, I was enabled to draft a trained nucleus for the organization of the ambulance company and base hospital. The work of these men, compared with that of the others, was such as to make it important, to my mind, to have similar organizations established throughout the country, so that no man of the hospital corps shall be assigned to duty with troops until he has had such instruction.

Ambulance Company No. 1.

	Regular Army.	Militia.
Medical officer	1	.....
Enlisted men	53	30

This company was organized on the grounds from a detachment from field hospital No. 1, detached hospital corps men from various posts, and detached from organized militia, an altogether heterogeneous mass which in no degree compared with the highly-trained body of men which should constitute an ambulance company properly organized for war, capable of giving full care to all casualties from the firing line to the field hospital. This was wholly due to the fact that the percentage of medical officers and hospital corps men allowed by law is wholly inadequate, only one medical officer instead of three being available for this duty, and if the wounded in future wars are to receive humane treatment and men are not to be taken from the firing line to aid in removing the wounded, it will require at least 5 per cent of the command to care for the actual wounded if operating in a heavily wooded or broken country, such as that which confronted us at West Point, Ky. The really excellent results obtained by Capt. P. F. Straub, assistant surgeon, U. S. Army, who organized and commanded ambulance company No. 1 with the raw material at hand, is deserving of the highest praise.

My remarks in regard to the necessity of having several thoroughly organized field hospitals only demand stronger emphasis when speaking of the ambulance company, and I would invite most earnest attention to the report of Capt. P. F. Straub, hereto appended, in this connection. It was only by drawing on the field hospital and the organized militia that I could even make a semblance of an organized ambulance company, and even then it was in no way such an organization as we should have in time of war. It would seem that under existing conditions some provision should be made for the organization of ambulance companies, such organizations being of paramount importance to the men on the fighting line. It may be said, and with truth, that our men of the hospital corps are trained in the essentials of first aid, but the ambulance company is the place where the man should be assigned who is to do duty on or near the firing line, and it will require all the drill and discipline he could possibly receive to render him effective in this hazardous position.

In a discussion of the work of the ambulance company which, of course, includes the removal of the wounded to the nearest field hospital and the rendering of all possible aid on the field, we should consider what can actually be done without subjecting the wounded, not to speak of the relieving force, to too great a hazard. It

is generally admitted that under the conditions of modern fire in an open country the safest place for a wounded man is on the ground, relying on his first-aid packet either applied by himself or his comrade. But if the country is broken and thickly wooded the pack mule can often get far nearer him than the ambulance, and all the necessary dressings and surgical appliances can be carried fully as well on the pack mule as on the ambulance, and the pack mule can go almost anywhere. I am therefore strongly of the belief that a pack train should constitute part of the transportation of the medical department in the field.

Base hospital.

	Regular Army.	Militia.
Medical officers.....	2	.....
Enlisted men	17	23

The base hospital was organized by Maj. Thomas U. Raymond, surgeon, U. S. Army, and consisted of a field equipment of about 110 beds. It was most advantageously situated in a grove of trees beyond Howard station and fully met all requirements, not only as an object lesson, but as a real base to which all patients were removed when the field hospital was moved to the front in the maneuver of October 8, 1903. The work of Major Raymond and his assistant, Lieut. H. L. Gilchrist, assistant surgeon, U. S. Army, in the organization and management of this hospital, was commendable.

Hygiene and camp sanitation.—The general hygiene and sanitary condition of the camp is one to which I desire to call particular attention.

The water supply of the camp proper was derived from driven wells and, although quite hard, was free from organic taint. The amount derived from these wells, while adequate for drinking and culinary purposes, was wholly inadequate for the necessary baths for the men. The Third Brigade—Michigan—was encamped along the Ohio River, and the men fully availed themselves of the bathing facilities afforded. The regiments of the other brigades were too far removed to make use of the river for this purpose.

The sanitary condition of the camps of the organized militia, with the exception of the First Wisconsin and the Eighth Ohio, were found on the first three days of the encampment to be very unsatisfactory. The sinks were not of the proper depth, were not limed or burned out, the ground in many places was badly fouled, and there was general tendency to disregard sanitary orders. The Third Brigade—Michigan—and the Kentucky contingent of the Fourth Brigade were noticeably deficient in this respect. Close inspections and forceful admonitions practically remedied these sanitary defects after the third day and thenceforth the entire camp was found to be and was left in good condition.

In this connection I would invite particular attention to the fact that, while these maneuver camps are supposed to be approximate to war conditions, they are in fact more or less permanent camps, and in my opinion, in order to conserve not only the health of the troops assembled, but the health of the surrounding community after they have dispersed, all possible precautions against the spread of disease should be taken, and therefore I believe that my recommendation that the "latrine trough" and the "odorless excavator" be supplied to the whole command, was well taken. While I believe that the burning out of the sinks with straw and petroleum and the free use of quicklime, as practiced at Camp Young, met the indications from a sanitary standpoint, still the fact remains that the possibility of soil contamination would have been wholly obviated by the use of the latrine trough, and the carrying of lime and petroleum is just as inadmissible as the carrying of the latrine trough with moving armies in time of war.

In the matter of equipment I would say that the ambulances furnished from the Jeffersonville depot, although of the most recent pattern, as attested by Lieutenant-Colonel Jones of the depot, were not equipped with boxes underneath the wagon bed for dressings and food supplies, as required by existing orders, and were therefore lacking in a most essential particular, viz, a ready means of giving sustenance to and a convenient place for carrying dressings for wounded soldiers who might be detained in the ambulance overnight or on the march. It would seem to me that inasmuch as the ambulance is an appurtenance of warfare that is used exclusively by the surgeon, no such vehicle should be accepted as fit for service until it has been inspected by a medical officer and found to meet his needs.

In this connection I desire to report that the necessity for the medical department to have transportation that is absolutely its own, not only in the matter of ambulances, but in the matter of all appurtenances of transportation necessary for its work, was again forcibly impressed upon me by these maneuvers. It would seem that the proper care and removal of sick and wounded is too serious a matter to be left to the judgment of a chance quartermaster in time of emergency, and transportation for sick and wounded should be as much under the control of the medical officer as his operating case or his medicine chest, for the one without the other may often lend but inadequate help to the stricken soldier.

In speaking of the organized militia I desire in conclusion to mention the fact that the personnel of most of the regiments was made up largely of mere boys, immature youths who would fall down by the score if subjected to a hard campaign in the Tropics, or almost anywhere else for that matter. This condition warrants serious consideration, and under the new relations existing between the Regular Army and the militia might be largely remedied if attention were invited to its paramount importance. With the probability of tropical service in time of war always confronting the American soldier, volunteer as well as regular, there is no place in either branch for the undeveloped boy.

Report of Capt. F. P. Reynolds, assistant surgeon, U. S. Army, commanding officer, field hospital No. 1.

Company of Instruction No. 1, Hospital Corps, left Washington September 22, 1903, 3 officers, 12 noncommissioned officers, 54 privates, and complete equipment for field hospital No. 1. Practically all the privates were recruits of less than two months' service. The company arrived at West Point, Ky., 4 p. m., September 23, and camped on the site previously selected for the field hospital. The hospital equipment was unloaded in less than one hour and was on the ground about one and one-half hours after the arrival of the train. The next day the hospital was pitched in accordance with the plan recommended by the board of medical officers, which was recently convened to revise the Drill Regulations of the Hospital Corps.

On September 26, 5 noncommissioned officers and 6 privates were ordered to report to Captain Straub, forming the nucleus of ambulance company No. 1. Most of these noncommissioned officers had had experience with Ambulance Company No. 3, at Camp Root, Fort Riley, Kans.

The site selected for the hospital was admirable in all respects, being well drained, centrally located, and adjoining the camp of the ambulance company. Water was obtained from a pump about 100 yards distant. Sinks were dug and cared for in accordance with circular 3, Headquarters Maneuver Division, Camp Young, West Point, Ky., September 26, 1903, and General Orders 2 of the division. The organization of the hospital was similar to that of Field Hospital No. 3, Camp Root, Kans., in 1902. This hospital had the decided advantage, however, in having with it a full complement of officers, noncommissioned officers, and men. The medical officers and noncommissioned officers had had considerable field experience.

The necessary guard duty was efficiently performed by members of the company, as the company equipment included six revolvers. It is my opinion that it is entirely practicable and in every way desirable that the hospital corps should guard its own property, as it is usually impracticable to obtain a guard from the line. This difficulty is particularly liable to occur when the guard is most needed, as in pitching the hospital after an action and on going into camp. If revolvers were added to the field hospital and ambulance company equipment, a satisfactory guard could, I think, be maintained, except under very unusual circumstances. Arms are necessary at many times and prevent the loss of much property. A guard was necessary on the car, which contained the field hospital and company property, at Washington as it remained on a siding over night. On arrival at the station and in unloading, a car can not be left without a guard, and it frequently happens that the unloading may be suspended for a number of hours, or perhaps over night. Again, after an action the field hospital pitches its equipment in a suitable place without regard to the location of troops and is somewhat off the route of march after an action; when a guard is most needed at the field hospital it is, I think, impossible to obtain one.

The merits of the medical, surgical, sterilizer, and detached service chests were abundantly proved. Their completeness and compactness have been highly praised by militia medical officers, and particularly by the military attachés who were at the maneuvers. The acetylene outfit worked satisfactorily throughout the encampment. The field furniture has had ample tests to show its practicability. No defects were noted in the bedding case. Some minor improvements might be made in the contents of the mess chest.

I am more than ever of the opinion that the Munson tent is unsuitable for field hospitals in campaign, and that its use should be limited to base or stationary hospitals and for field hospitals in camps of instruction. It weighs considerably more than the common hospital tent, it is difficult to pitch, and the pitching requires about twice the time. A double line of guy pins is necessary to pitch it. They get out of order easily and are then useless. Their added weight and difficulty in pitching are, however, the important considerations which make them unsuitable for campaign.

The important subject of the transportation of the field hospital was given attention by me, as I was informed that the officers of the General Staff detailed for duty at the maneuvers had been directed to inquire particularly into this matter. As was the case at Fort Riley last year, there was much delay in getting together complete transportation. On September 25, mules were obtained; on the 26th, escort wagons were gotten, but without spare parts, none being on hand; on October 1, harness, currycombs, and whips; but it was not until October 3 that complete harness and lash rope for wagons were supplied. Prior to this date there was lash rope for but four wagons and harness for but six teams. As a consequence the field hospital was not prepared to take part in the maneuvers until October 3. All requisitions on the Quartermaster's Department were filled as soon as the articles could be obtained. The division quartermaster showed much interest in our equipment and made every endeavor to obtain the articles asked for. On October 8 the hospital was packed and loaded on wagons and followed the division in the maneuvers. On that date the hospital proceeded to Stithston, about 7 miles from camp, over a rocky road, in which were several short hills; arrived in Stithston in two hours after leaving the camp; selected a suitable site about 2 miles in rear of the division and pitched its camp; was prepared to receive patients within one-half hour after arrival; all the wards consisting of eighteen hospital tents were pitched in about one hour and a half; patients began arriving about one hour later, and during the afternoon twenty-one were received and assigned to wards. The hospital remained over night, returning to Camp Young at 11 a. m., October 9.

In compliance with previous orders, on October 10 the hospital was packed and loaded on the car, and on October 11 the company proceeded to Fort Riley, Kans., to take part in the maneuvers at that point.

Report of Capt. P. F. Straub, assistant surgeon, U. S. Army, commanding officer, ambulance company No. 1.

The company was organized September 27, 1903, with the following personnel: One officer, 2 sergeants, first class, 2 sergeants, 1 corporal, 15 privates, first class, and 15 privates, hospital corps. On October 2 the strength of the company was increased by 1 sergeant, first class, 9 privates, first class, and 8 privates, hospital corps. On October 5, 1903, a further gain of 30 privates, Hospital Corps, from the organized militia brought the total strength of the company to 6 noncommissioned officers, 24 privates, first class, and 53 privates. However, the 30 men from the organized militia in reality added but little to the actual strength of the company. They were almost without exception poorly developed boys, without experience or training, and were evidently considered unfit for duty with their company. Many of them were detailed to the hospital corps against their own will and possessed no inclination or qualifications for their duties. In the short time at our disposal very little could be done in the way of instruction. None of them was really available as litter bearers, as they were not strong enough to carry burdens.

It would be tedious to enumerate the difficulties in organizing a company from such a heterogeneous mass of material—men from a variety of posts and militia regiments, very few with any but a general idea of what was to be required of them. Maneuvers should be a culmination of the years of practical instructions of an organization, and to attempt to organize a company and put it into the field at the same time would seem to be inviting disaster. Most of the noncommissioned officers assigned to the company were very energetic and did their duty in a most intelligent manner, but I can foresee the awful confusion that will result when, if another war breaks out, companies are to be organized out of raw material. Broken poles and overturned ambulances gave a hint of what can be expected from untrained drivers.

In the attempt to convert this mob into an organization, the introduction of 30 perfectly raw militiamen further complicated the situation. Much to my surprise the company soon had the superficial appearance of an organization and in a few days the duty in the field was performed in a satisfactory manner, showing that the majority of the men were much interested in their work. The usual camp routine was carried out systematically and with military precision. Nevertheless, I am satisfied the company could not have stood the strain of actual service and this numerically strong company could not have rendered one-fourth the service of a trained company of half the strength.

It appears to me that in time of peace ambulance companies should be organized, not with a full number of men, but with enough to make it possible to expand to the regulation requirement without breaking down the organization. An ambulance company can no more be organized in a minute than a troop of cavalry.

I speak freely on this subject, as I have seen the work of the hasty provisional organizations doing ambulance work, especially at dressing stations in actual service, and have also been impressed with the much better and more rapid work of trained men. The personnel referred to was trained at the expense of the sick and wounded.

The means of transportation were as follows:

Ambulances, new pattern.....	15
Ambulances, old pattern.....	2
Escort wagons	3
Draft animals.....	40
Saddle horses	12

The new pattern ambulances were not provided with boxes for dressings and hospital stores. No guidons were furnished. About one-half the water tanks on the ambulances were in a leaky condition, and by exchanging them from one ambulance to another each ambulance was provided with one serviceable water tank.

There were not enough animals to furnish more than two for each ambulance, but that sufficed for the character of the work to be done.

Most of the work was done by sections of the company under a noncommissioned officer, which reported to the chief surgeon, and was usually split up and an ambulance sent with each regiment.

No attempt was made to use the ambulance section as contemplated in regulations, viz, to establish ambulance and dressing stations, as might easily have been done. Had each section been under the command of an officer of the ambulance company the scheme could have been carried out fully and would have been a valuable object lesson to all concerned. On two occasions the entire company was ordered out and an attempt made to carry out the regulation scheme and it was found an interesting and valuable experience; the first time a section was sent out to each brigade, and ambulance and dressing stations were formed and all arrangements made for actual service. It was found that the division would take up position on a certain crest and from a study of the map and ground proper locations for the stations were picked out. The ambulance company was rendezvoused at the ambulance station, and by means of the noncommissioned officers of the company and the several brigade surgeons the probable locations of the regimental aid stations were found, the roads leading thereto investigated and a report made to the commanding officer at the ambulance station. All arrangements were complete before the battle opened and under the circumstances it would have been easy to have cared for a large percentage of casualties.

On October 8 diagnosis tags, 150 in number, were given to the umpires, the distribution to be confined to one brigade. The tags were to represent an average casualty of a brigade, and in accordance with the statistics on the subject only about one-fourth that number would need litter transportation, the balance could walk to the ambulances and dressing stations. It was not possible to ascertain just where the battle would be fought, but it was clear that it would be near to the main pike upon which the largest part of the command was moving. It was deemed safe to establish the dressing station at a certain crossroads, accessible from all parts of the field. All surgeons were informed of the dressing station and further warned that the ambulance station would be at the L. and N. pike at a safe distance in the rear of the main column. An ambulance section of the company was sent out on a parallel road a mile distant to follow the left wing and to establish a supplementary ambulance station at a safe distance in the rear of the line. Owing to the nature of the ground nothing was done until the firing had ceased, and then the medical department became very active; the wounded were collected and dressed at the regimental aid stations and a very large per cent of those tagged were assembled.

The ambulances were loaded with the litter cases and brought to the dressing stations where they were dressed, registered, and then forwarded to the field hospital. Only a part of the number tagged were brought in; over two-thirds of the litter cases were delivered to the field hospital, but many of the "slightly wounded" took off their tags and dressings and rejoined their regiment. On the whole the maneuver on this day was a success, and I am convinced that as soon as everyone understands the object of our efforts there will be no difficulty in carrying out our scheme with great success.

I am convinced that we can derive as much benefit and experience out of such maneuvers as the line. The medical service in the field must be as well organized

as the other branches, and by frequent repetition of the maneuver much valuable experience in collecting and dressing and transporting wounded may be obtained. It is further suggested that a preliminary course of "Tactics for Medical Department," such as are given in many foreign services, would be productive of much benefit and would make a field organization much more easily obtainable. The first few days of the maneuvers are usually devoted to outpost duty, etc., and leave little for the medical department. This might be devoted to such study. Many points can thus be brought to the attention of the medical officers that are ordinarily acquired by hard knocks in the field. It is not possible to deduce from the experience at the maneuvers what an ambulance company could accomplish in the field were it of regulation strength; although from my limited experience in actual warfare it would seem to me to be abundantly able to care for the wounded of a brigade, and with the assistance of regimental medical officers could clear the field and dress the wounded in a comparatively short time. The enlisted strength would seem ample, but it would hardly be possible for two medical officers to dress the average casualties of a brigade in a reasonable time without further assistance from regimental surgeons. Field service at the maneuvers can not give any indication as to what supplies are to be carried for the ambulance and dressing stations. Any one who has had actual service at a dressing station could easily determine what would be necessary.

Report of Maj. T. U. Raymond, surgeon, U. S. Army, commanding officer, base hospital.

Paragraph 6, Special Orders No. 7, Headquarters Maneuver Division, Camp Young, West Point, Ky., October 1, 1903, assigned me as commanding officer base hospital, and under verbal instructions from the division surgeon I proceeded on October 3 to pitch and equip a hospital of 108 beds on a site already selected, within easy reach of all organizations comprising the Maneuver Division.

The camp site was an ideal one, an open space within a grove of magnificent beeches, the median line of the hospital occupying a slight ridge from which the ground fell away very gradually toward each flank.

The regulation equipment for a hospital of 108 beds was on hand at Camp Young, and the work of transferring it to the proposed site was already begun under the supervision of Lieut. H. L. Gilchrist, assistant surgeon, U. S. Army, who continued on duty with me from the organization of the hospital until its discontinuance, and proved himself an able and valuable assistant. The personnel of the hospital on October 3 consisted of 1 major, surgeon; 1 lieutenant, assistant surgeon; 1 sergeant first class, and 5 privates first class, hospital corps of the Regular Army, and 4 non-commissioned officers and 7 privates of the Indiana Organized Militia.

With these men, assisted by a detail from the Hospital Corps Company of Instruction No. 1, the tentage for the entire hospital (comprising 45 tents) was pitched, floors being provided for all hospital tents, and the authorized field equipment was unpacked and placed in condition for use, and the hospital began to receive patients on the evening of October 4.

From that date until October 15, 57 patients were received, of which number 17 were militia.

Of the militia, all were returned to duty either during the period of the maneuvers or upon the departure of their respective organizations for their homes. Of the regulars 8 were returned to duty and 32 were transferred to the home stations of their organizations. No death occurred.

Of the 17 cases of militia treated, 2 were venereal, 3 were injuries, 9 were fevers, 2 were digestive troubles, and 1 rheumatism. Of the 40 cases of regulars treated, 18 were venereal, 3 simple adenitis, 4 injuries, 7 digestive troubles, 2 fevers, and 1 each of cellulitis, neuralgia, tonsillitis, furuncles, bronchitis, and nasal hemorrhage.

On October 4 the detachment of the hospital corps on duty at the base hospital was increased by 11 enlisted men of the Regular Army, and on October 5 by 12 enlisted men of the Michigan Organized Militia, making a total strength of 40 men.

From this time until October 10, on which date the militia left the maneuver camp, the routine duties of the hospital corps were performed by them and by the regulars on duty without discrimination, the surgeon having in mind in his assignments only the individual fitness of the men for the particular duty assigned them. Drills were established and carried out so far as time for them could be spared from other necessary duties. The behavior of the militia on duty at the base hospital merits nothing but commendation; there were no breaches of discipline, and the men were ready to learn, willing, and obedient.

As one body of men compared to another the contingent from Indiana was, I should say, considerably superior to the contingent from Michigan, and I believe the secret of the difference to lie in the fact that the Indiana Organized Militia comprises an

organized hospital corps, while the Michigan Organized Militia depends upon details from the companies for duty at the hospital during field service.

On October 9, 16 privates, hospital corps of the Regular Army, joined for duty at the hospital to replace the men of the Indiana and Michigan militia, who left for home with their organizations on the following day.

Under verbal orders from the division surgeon the base hospital was discontinued on October 15, all patients having been disposed of as indicated above, and the commissioned and enlisted personnel of the hospital being disposed of according to assignments directed in General Orders No. 32, Headquarters Maneuver Division, Camp Young, West Point, Ky., October 13, 1903.

On the following day the medical property was packed and shipped to the medical supply depot, St. Louis, Mo., and the quartermaster property was returned to the chief quartermaster of the Maneuver Division.

As regards the medical aspect of the maneuvers as observed by me while acting as chief surgeon of the brown and of the blue armies, respectively, I have the honor to state that I believe the maneuvers to be of great practical value to the Medical Department of the Army in the way of instruction, both by observation of and by actual participation in the movements of large bodies of troops under circumstances simulating as nearly as possible the conditions of war.

In the disposition of the medical department in the field it was evident that the chief surgeon of an army needed a copy of all orders for the general movements of troops which were issued by the commanding general to his subordinate commanders, in order that he might intelligently locate and assign the medical personnel.

It further appeared to me that under the conditions of modern warfare we would have to abandon the idea of rendering first aid to the wounded on or near the line of battle so long as the engagement was actually in progress, depending almost wholly during that time on the use of the first-aid packet by the wounded man himself or by a comrade.

It is of course essential that the Medical Department keep in constant touch with the line in order that any necessary changes of position may be recognized and made quickly and that the medical and surgical assistance may be rendered on the field as soon as the conditions of the engagement will permit. This, however, will hardly be until either the line has advanced or the firing has ceased.

Troops for the maneuvers at Fort Riley, Kans., assembled in October, 1903. The following extracts are quoted from the report of Lieut. Col. J. Van R. Hoff, deputy surgeon-general, U. S. Army, who acted as chief surgeon of the provisional division at that camp:

The undersigned was notified September 26, 1903, that he would be detailed as chief surgeon of the command assembled October 15 at Fort Riley, Kans., for maneuvers.

Based upon Circular No. 3, current series, Adjutant-General's Office, the medical organization for the proposed command should consist of a field hospital and ambulance company for each brigade, of which there were five, exclusive of engineers, hospital corps, signal corps, and artillery, which latter constituted the divisional organization. The regulations (Manual for the Medical Department, 1902) are, however, somewhat at variance with this view, as therein it is set forth that three field hospitals and ambulance companies will ordinarily be provided for a division of normal strength (18,000).

It will be recalled that the provisional division had five brigades. In the absence of specific instructions to the contrary, it was assumed that two field hospitals and two ambulance companies, in addition to the regimental medical equipment and base hospital, would meet the actual hypothetical requirements of the provisional division of approximately 11,000 strength. Upon this assumption the organization was perfected.

It may be interesting to glance at the development of the Medical Department at maneuvers, beginning with the first in this region, when in 1888 the Fifth Cavalry assembled near Guthrie, Okla., followed the next year by the much more extensive operations at Chilocco under General Merritt; then the maneuvers of 1902, and finally those of 1903, at all of which the undersigned acted as chief surgeon.

In 1888-89 one looked in vain for any regulation prescribing the medical equipment and personnel for any command beyond the mere allowance of medicines, and what it had depended upon the organizing capacity of the medical officer and the complaisance of his commander. What we had at both of these maneuvers was absolutely improvised. The contingency was met, but had it not been no one on the ground could properly have been blamed.

An excellent regimental medical field equipment was devised in 1891 and used until the beginning of the Spanish-American war, when another was substituted, which in turn gave place to that of 1900 and 1901, but even yet the field hospital, as such, was without form and void.

The regulations of 1902 (Manual for the Medical Department) set forth for the first time a detailed statement of the complete equipment of the field hospital and ambulance company, showing exactly the material to be supplied by each department. This was done advisedly, so that there could be no misunderstanding on the part of anyone as to exactly what these organizations consisted of—what was to be supplied by the Quartermaster's Department as well as the Medical Department—what the capabilities of the organizations should be and how they were to be conducted.

Great care was taken to provide for a minimum of clerical work in the assembling of material. A requisition of one line reading, "Medical supplies for three field hospitals" or "Quartermaster supplies and transportation for three ambulance companies," being all that is necessary to indicate to the issuing officer what is needed, and all he has to do is to turn to the regulations for the details.

As these regulations were promulgated shortly before the maneuvers of 1902, and were probably unknown to the Quartermaster's Department, the writer, who was then on duty in the War Department, made out in detail the necessary requisitions upon all departments and assembled at Fort Riley the complete equipment of a field hospital and ambulance company, to which the Surgeon-General added the equipment of three regimental hospitals.

Later, having been detailed as division surgeon, I had an opportunity of observing the efficiency of these organizations and of suggesting that this equipment be permanently retained in the possession of the surgeon, Fort Riley, which was so ordered by the Secretary of War.

Upon receiving notification that I was to be detailed as division surgeon at the Riley maneuvers of this year, I so advised the Surgeon-General, and addressed a communication to the division quartermaster, September 29, 1903, informing him that two field hospitals and two ambulance companies would be organized in connection with the provisional division. No details were entered into except in response to a telegram from him as to the number of animals required by the Medical Department.

This was done advisedly, for if the Medical Department must depend upon the Quartermaster's Department for material vital to its efficiency in the field, that department should be fully prepared to meet the contingency. Such was not the case at Camp Sanger, and such will probably never be the case unless everything, except possibly animals, supplied by the Quartermaster's Department, is turned over to the Medical Department, and actually kept in its possession. There is apparently no more reason why all quartermaster property should be held by an officer of that department than should ordnance or other property. Certainly the present regulation works evil to the Medical Department.

Fortunately most of the supplies that had been accumulated at Fort Riley the previous year, and held there by a specific order, were available, and field hospital No. 1 came from West Point, Ky., complete, except for transportation. So we managed to get along, but it is easy to see that both our field hospitals were completely immobilized for want of transportation that should have been on the ground. We were able to move but two sections of one hospital (No. 3) for use in the maneuvers, and these only by using the transportation pertaining to the ambulance companies, which was actually needed with those organizations. Regarding minor things, such as stoves, picket lines, cooking apparatus, tent pins, etc., we were at endless trouble getting them, though most of these had been assembled by me the previous year, and that we were able to accomplish anything satisfactorily was simply due to the enthusiasm and untiring energy of the medical officers on duty with the division organizations. I feel it my duty to make this specific statement so that our requirements will be impressed upon the Quartermaster's Department, and when we are turned out for real war the Medical Department will not be subjected to the petty annoyances and delays which, with less experienced medical officers, would mark the difference between success and failure with us, when failure would mean much to the Army and the country.

working organization. All ambulances of obsolete model should be turned in to the Quartermaster's Department to be used as spring wagons, and only the latest model used for medical department work. It is quite as important from our standpoint that the sanitary soldier should know his ambulance as from the artilleryman's standpoint that the gunner should know his gun.

The question of wheeled transport is one of the most serious problems confronting the medical department in the field, and upon its solution depends in a large degree the success of our department. It can not be left to any other department, for if it is, then are we the slaves of an irresponsible master, and yet we can not properly care for it unless additional means to this end are furnished us. Foreign armies have met this in two ways—one by adding a class of nonmedical officers to the cadre of the medical department for nonmedical services, and the other by attaching transportation from a regularly organized military transport corps, thoroughly disciplined and trained in their duties; in a word, soldiers, and not an aggregation of "mule-skinners," picked up anywhere and wholly unfamiliar with discipline of any kind. A general service corps is one of the most crying needs of the Army. When such a corps shall be organized the field work of the medical department will be easier of accomplishment, for then as many sections of the transport division of the general service corps as may be necessary will be attached to us for duty; will, in fact, become a part of us, entirely under our control, and will relieve us of much that adds to the weight of our already overburdened shoulders. I presume this statement is equally applicable to every other branch of the Army.

Before leaving the subject of organization, I venture to invite attention to the importance of efficient administration. The work that falls upon the administrative medical officer of a large body of soldiers must be experienced to be appreciated. It will be observed that the strength of the medical department of the provisional division was nearly as great as that of some of the battalions. Had any major there been notified to proceed to Fort Riley for the purpose of organizing a battalion from little detachments of officers and men, to be gathered from every section of the country, and have it ready for immediate service, his task would have been identical with that of the division surgeon.

The provisional division was in existence scarcely more than two weeks, and yet during that period the records of my office show 334 letters sent and 261 letters received. Each day's reports of sick and personnel were consolidated, so that the division commander might have at hand an exact knowledge of the amount of noneffectiveness from sickness, and the strength of the personnel to care for it. Final reports of sick and wounded and personnel were forwarded to the Surgeon-General.

The average sickness was 2.2 per cent. At no time did it reach 3.5, nor should it, even under less favorable circumstances, for the command had left its sick and weaklings at home posts. The Third Corps at Chickamauga had very little more sickness for the first month it was in camp there, but later the story was different.

Ten cases of typhoid fever occurred, with one death. The outbreak was investigated by a board of medical officers, who found that this infection was in nowise due to insanitary conditions at the camp, but to importation, exactly as was the case during the Spanish-American war. The infected command was at once isolated. This was not done at Chickamauga, not because the medical department did not recommend it, but because the responsible officer failed to see the necessity. In camps typhoid fever should be as carefully quarantined as any other infectious disease. One case of scarlet fever appeared.

The sanitary arrangements of the camp and the police rules were practically the same as last year, as was the camp ground. The arrangements were of the most primitive character; the rules were sound and strictly enforced, and the health of the command, as previously stated, was satisfactory.

It is probable that a camp with such sanitary appliances, or lack of them, could be maintained two or three weeks each year for an indefinite period without serious detriment to health, provided the conservancy was as good. But we can hardly hope to find in many of our camps of mobilization such a man to command or such men to obey as were found at Riley, and yet this is the example of castrametation we hold up for our citizen soldiery to follow. If we learned anything in the Spanish-American war, it was that such sanitary arrangements as were had in the maneuver camps of 1902-3 were bound in time to propagate typhoid, and it may well be asked, in the light of that experience, if, all other things excluded, we have a moral right year after year to use methods of camp sanitation that proved absolutely defective when we most needed the best devisable. I know not if General Orders No. 170, series of 1899, has been repealed; it certainly was not observed either at Camp Root or Camp Sanger, but I do know that the plan of latrines therein described was the result of a very bitter experience, in which many lives were needlessly sacrificed. To be sure, there is another side to this question, and the lesson given at Riley may

not have been intended to convey the idea and methods of a fixed camp, but to show how a temporary camp of troops in campaign should be cared for. From this standpoint the lesson was well taught.

The method of conservancy employed last year was followed this. The latrines were limed and burned out daily; kitchen wastes were thrown into the river and manure was carried a suitable distance away. No serious sanitary faults were committed and little ones were at once discovered and corrected. All camps were good, but of course some were much better than others, in which connection I would respectfully invite attention to the numerous compliments paid to the camp of the divisional medical establishments.

The medical department took its appropriate part in the tactical problems and, *mutatis mutandis*, did about what it would have done had the rifles contained bullets instead of hot air.

The importance to them of some knowledge of the tactical working of the medical department of an army has apparently not penetrated the minds of all combatant officers. It has been truly said that a medical department is a handicap to a fighting force, but not so great a handicap as uncared-for wounded. And what general would be without a medical department with a fight in immediate prospect? The exact weight of the handicap should be known to every commander, and the fighting contingent trained to carry it. Armies have been destroyed and campaigns lost for want of a due appreciation of the least of these handicaps, the medical department, and this fact should receive the consideration due it.

In concluding this phase, I desire to reiterate that too much stress can not be laid on the statement in my last report that the maneuver problems should be made as realistic as possible in every respect, so that the relative value of each element can be determined, and the work made equally instructive to all engaged. The medical department very much needs instruction in actually handling wounded on the battlefield, and the line to learn what its proper share in this direction is.

The attempt to carry on in the field the theoretical instruction of the post was not entirely successful, nor was it expected to be. The experience gained in campaign, which the maneuvers closely approximate, was all and more than the men of the hospital corps could assimilate. Everything they had to do was new to the most of them and a valuable experience to all. Especially was this so in the divisional medical organizations.

In addition to the lectures by the division surgeon in the general course on "The Medical Department in Actual Service," several lectures by medical officers were given at Field Hospital No. 3, as follows:

Lecture I.—Lieut. Col. J. Van R. Hoff, deputy surgeon-general, U. S. Army: "The Medical Officer," Tuesday, October 20.

Lecture II.—Maj. E. B. Frick, surgeon, U. S. Army: "A Brief Consideration of Tropical Diseases and their Prevention Among Troops," Wednesday, October 21.

Lecture III.—Capt. F. P. Reynolds, assistant surgeon, U. S. Army: "Instruction of the Hospital Corps," Sunday, October 25.

Lecture IV.—Capt. F. A. Winter, assistant surgeon, U. S. Army: "Field Sanitary Organization," Monday, October 26.

Lecture V.—Lieut. Col. E. F. Gardner, deputy surgeon-general, U. S. Army: "Sanitary Inspections and Reports," Monday, October 26.

The subjects of the lectures were quite generally discussed by the medical officers and served to promote a mutual understanding of each other and a broader view of the work of the Medical Department. Line as well as our own officers were invited.

The distribution of the personnel at the conclusion of the maneuvers was easily and quickly accomplished by returning all men temporarily detached from organizations on the ground to their proper commands, and concentrating all unattached men in ambulance company No. 1, whence they were distributed by rail to their various stations.

Practically all reports of sick and wounded and returns of the hospital corps were in the hands of the division surgeon the day the command dispersed, and were duly forwarded to the Surgeon-General. Final reports from the Texas regiment never reached this office.

The conclusions to be drawn from the experience of the Medical Department in the maneuvers of 1903 are:

1. Its commissioned and enlisted personnel was inadequate. I do not mean inadequate for the care of the actual sick, for what sick we had were very well cared for, but for the maneuver work as well. Each regiment should have had at least two medical officers actually with it, and the present allowance to the divisional medical organizations should be the minimum, to be supplemented in actual (maneuver) service by the third regimental officer.

2. I was fortunate in finding two experienced medical officers of the National

Guard, who were detailed as brigade surgeons of the Third and Fourth Brigades, but one can not hope to be always equally fortunate in this respect, and therefore provision should be made to have at all maneuvers a sufficient number of ranking medical officers to fill the administrative positions. Such was not the case at Camp Sanger.

If the object of these functions is to teach practical warfare the teacher should be a professor of the art and not be sought in the ranks of amateurs, no matter how bright or experienced the latter.

3. I find upon rereading my report of the maneuvers of 1888 the Medical Department has gotten during the fifteen years interval all therein recommended, except a satisfactory solution of the matter of transportation. To be sure, regulations state exactly what we shall have, but the quartermaster determines whether or not we shall get it. If the General Staff, or any other authority, will only arrange matters so that the Medical Department can obtain from the Quartermaster's Department or be permitted to purchase for itself things absolutely essential to its efficiency in active service, a great thing will have been accomplished.

4. The care of the wounded, except in its strictly professional application, pertains quite as much to the line as to the Medical Department. It assumes great importance in war, so great indeed that the results of campaigns are influenced thereby, but in peace this is apparently forgotten or ignored. I believe more attention should be given to this phase of the maneuvers—not during the contact, to be sure, for fighting is the first business of soldiers, but after the contact details from the companies should be made to search for the wounded and carry them into the aid stations, just precisely as would be done on the battlefield.

These various reports so fully cover all points of particular interest to the Medical Department in connection with the maneuvers as to render superfluous their further extended discussion.

I am thoroughly in accord with the conclusions reached by the chief surgeons in reference to the sanitation of camps. Insufficiency of transportation and duality in its control have always proved a stumbling-block in the way of efficient medical service in the field. The subject has received the close study which its importance merits, and the requirements of the Medical Department have been clearly presented to the General Staff.

Deficiency in the personnel of the regular establishment was glaringly apparent. This was true, notwithstanding the fact that all posts, as far as possible, had been stripped of medical officers and hospital corps men. It is manifest that a department which can not supply sufficient officers and men to participate in maneuvers is dangerously undermanned.

The medical and hospital corps personnel of the militia is not yet properly organized or instructed. The field organization of all States should correspond to that of the Regular Army, and sufficient instruction should be given so that the rudiments need not be taught at maneuvers which should be devoted to the application of principles already learned and to advanced work.

SPECIAL SANITATION.

A high compliment has been paid the Medical Department of the Army in the selection of several of its members to take charge of important sanitary works not directly connected with the military service.

Col. W. C. Gorgas, assistant surgeon-general, U. S. Army, and Maj. L. A. La Garde, surgeon, U. S. Army, have been detailed for duty as sanitary officers of the Isthmian Canal Commission, the former being the senior sanitary officer of the Commission. The great advances which have been made in tropical sanitation in recent years, especially in the control of yellow fever and malarial fever with which

control the name of Colonel Gorgas is already so well identified, give promise of a repetition of the brilliant success attained at Havana.

Capt. Bailey K. Ashford, assistant surgeon, U. S. Army, was detailed as the senior member of a board appointed for the study of anemia in Porto Rico by the governor of that island. In a preliminary report Captain Ashford shows the widespread prevalence of the disease, that it is due to infection with the *uncinaria Americana*, and that it yields readily to treatment with thymol. The disease affects a very large proportion of the dwellers in the country districts whose occupation brings them in contact with the soil, and as it is also widespread in the southern United States and in the Philippines the results obtained by this Commission will have an important economic bearing.

Captain Ashford deserves great credit for the excellent work he is accomplishing.

Maj. E. C. Carter, surgeon, U. S. Army, and Capt. E. L. Munson, assistant surgeon, U. S. Army, have acted respectively as commissioner and assistant to commissioner of public health for the Philippine Islands and the city of Manila, and have rendered admirable services in that connection.

Maj. Thomas U. Raymond, surgeon, U. S. Army, has been on special duty with the Louisiana Purchase Exposition and has general charge of sanitary conditions in the Exposition grounds, while Capt. Llewellyn P. Williamson, assistant surgeon, U. S. Army, has had similar duties in connection with the Philippine exhibit and the Philippine village.

RECRUITING.

During the year 32,213 applicants for enlistment were examined: White, 30,634; colored, 1,271; Filipino, 308. Of these 20,089 were accepted: White, 18,991; colored, 809; Filipino, 289. The ratio of those accepted per thousand examined was 623.63 for the total; 619.93 for whites; 636.50 for the colored; 938.31 for Filipinos. These figures represent men found physically qualified and enlisted from among those who were presented to medical examiners. In reality, a much smaller proportion of applicants for enlistment was accepted, as in accordance with the usual practice the most undesirable candidates were rejected by recruiting officers or sergeants and therefore do not appear in these statistics.

In 1902, 736 Filipinos were examined, of whom all but 20 were accepted. Figures for Filipinos, while of interest for comparison one with another by years, should not be contrasted with those of other classes, as this would result in a false estimate of the physical fitness for soldiers of the Filipino people as compared with whites and colored. The much larger proportion of candidates accepted for enlistment among the former is due to the fact that recruits for the Philippine Scouts are examined much less rigorously than those of the Army generally, and that they are picked men, the great majority of whom have had previous service of one kind or another. Among the whites and colored the ratio of accepted recruits does not vary materially from that of the preceding year, in which it was 667.34, while this year it is 620.59 per thousand. The slight fall is ascribed to strong efforts made during the year to prevent medical examiners from accepting physically unfit men, rather than from any change in the material offering itself for enlistment.

On account of the lack of medical officers, very few of them are available for the examination of recruits, and this important duty is in consequence largely delegated to civilian physicians. Occasionally gross carelessness is manifested by a civilian examiner, and he is no longer given employment in that capacity. However, the majority of poor men are accepted on account of ignorance on the part of these examiners as to what should be the physical characteristics of recruits. Though hard and fast rules are laid down to govern the examination of candidates for enlistment, knowledge is required to apply such rules or desirable men will be rejected and undesirable ones accepted. There is no means by which the loss to the Army of promising material because of the former error can be estimated, but that under the present system too many physically unfit men are accepted for the service is clearly shown by the numerous discharges for disability soon after enlistment and by the reports of medical and other officers on the poor quality of recruits received at posts. The only sane policy to follow is to discharge all physically disqualified men as soon as they are discovered, as retaining them in the service can only result in further loss to the Government in an attempt to build a superstructure without a foundation. The expense incurred in consequence of such enlistments invariably falls on the Government, as the recruiting officer can not be held responsible, for he naturally depends on the physical examination by the physician, and the latter is a civilian employee, from whom nothing can be collected, and whom it is frequently unwise to discharge, as only men with less qualifications for the examination of recruits may be available.

Moreover, as a result of the ineffective methods of examination, a class of men is taken on the border line between physical fitness and unfitness who would never have been accepted by a competent examiner. Once enlisted, some of these men are retained, as the Government has been put to considerable expense on their account, and there is a chance that they may become of value. This hope often proves an elusive one, and such men only serve to swell the muster rolls.

The physical examination of recruits is a specialty, the mastery of which requires instruction, study, and experience. It is not a branch of general medicine in which civilian practitioners can be expected to attain the results of qualified officers of the Medical Department. The efficiency of an army depends largely on the physical fitness of its recruits, and for their examination the technical skill of a physician in active practice, with knowledge of the requirements of the service, in other words, the skill of a trained medical officer is needed, who should be held to a rigid accountability for accepting physically unfit men. It is unfortunate that under present conditions such officers are not available, and no one can be made responsible.

The greatest number of rejections of applicants was made on account of imperfect vision, heart disease, varicose veins, varicocele, hemorrhoids, and venereal diseases. The heights of accepted recruits vary from 4 feet 10 inches among the Filipinos, to 6 feet 4 inches and over for 5 Americans. The chest mobility of a large proportion of the men enlisted was 3 inches, and very few were taken in which it was less than 2 inches; above 5 inches was also rare, the very greatest expansions recorded in some candidates being due to muscular action, and not a measure of the expansibility of the chest cavity.

REPORT OF THE SURGEON-GENERAL.

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Nativity of recruits accepted during the year 1903, with ratios per thousand accepted.

	White.		Colored.		Filipino.		Total.	
	Num-ber.	Ratio.	Num-ber.	Ratio.	Num-ber.	Ratio.	Num-ber.	Ratio.
United States (continental).....	16,120	802.93	802	39.92	.....	.....	16,932	842.85
Porto Rico.....	15	.75	1	.05	.....	.....	16	.80
Pacific Islands.....	.....	.....	.....	.....	289	14.39	289	14.39
England.....	343	17.07	1	.05	.....	.....	344	17.12
Scotland.....	76	3.78	.....	.....	.....	.....	76	3.78
Ireland.....	602	29.97	.....	.....	.....	.....	602	29.97
Canada.....	273	13.59	2	.10	.....	.....	275	13.69
France.....	28	1.39	.....	.....	.....	.....	28	1.39
Holland.....	34	1.69	.....	.....	.....	.....	34	1.69
Denmark.....	75	3.73	.....	.....	.....	.....	75	3.73
Scandinavia.....	199	9.91	.....	.....	.....	.....	199	9.91
Germany.....	766	38.13	.....	.....	.....	.....	766	38.13
Switzerland.....	58	2.89	.....	.....	.....	.....	58	2.89
Austria.....	128	6.37	.....	.....	.....	.....	128	6.37
Hungary.....	14	.70	.....	.....	.....	.....	14	.70
Russia.....	118	5.87	.....	.....	.....	.....	118	5.87
Italy.....	43	2.14	.....	.....	.....	.....	43	2.14
Cuba.....	.....	.....	1	.05	.....	.....	1	.05
Others.....	89	4.43	2	.10	.....	.....	91	4.53
Total foreign.....	2,846	141.66	6	.30	.....	.....	2,852	141.96
Grand total.....	18,991	945.34	809	40.27	289	14.39	20,089	1,000.00

Causes of rejection among 32,213 candidates for enlistment examined during the year 1903, with ratios per thousand.

Number examined.....	White, 30,634.		Colored, 1,271.		Filipino, 308.		Total, 32,213.	
Causes of rejection.	Num-ber re-jected.	Ratio per 1,000.	Num-ber re-jected.	Ratio per 1,000.	Num-ber re-jected.	Ratio per 1,000.	Num-ber re-jected.	Ratio per 1,000.
<i>Special causes.</i>								
Physical debility.....	7	0.24	.....	.....	.....	.....	7	0.22
Tuberculosis of lungs and other organs.....	143	4.67	9	7.08	4	12.99	156	4.84
Imperfect vision.....	914	29.83	15	11.80	.....	.....	929	28.84
Heart disease.....	919	30.00	19	14.95	2	6.49	940	29.18
Goiter.....	6	.20	.....	.....	.....	.....	6	.19
Varicose veins, varicocele, and hemorrhoids.....	1,255	40.96	18	14.16	1	3.25	1,274	39.55
Hernia.....	380	12.40	5	3.93	.....	.....	385	11.96
Flat feet.....	183	4.34	1	.79	.....	.....	184	4.16
<i>General causes.</i>								
[Excluding those above.]								
Epidemic diseases.....	1	.03	.....	.....	.....	.....	1	.03
Venereal diseases.....	800	26.11	65	51.14	3	9.74	868	26.94
Other general diseases.....	17	.55	.....	.....	1	3.25	18	.56
Diseases of the nervous system.....	20	.65	.....	.....	.....	.....	20	.62
Diseases of the eye.....	74	2.42	3	2.36	1	3.25	78	2.42
Diseases of the ear.....	140	4.57	4	3.15	1	3.25	145	4.50
Diseases of the circulatory system.....	23	.76	1	.79	1	3.25	25	.78
Diseases of the respiratory system.....	159	5.19	11	8.65	1	3.25	171	5.31
Diseases of the digestive system.....	499	16.29	11	8.65	.....	.....	510	15.83
Diseases of the genito-urinary system.....	146	4.77	5	3.93	1	3.25	152	4.72
Diseases of the skin and cellular tissue.....	245	8.00	10	7.87	.....	.....	255	7.92
Diseases of the organs of locomotion.....	369	12.04	11	8.65	.....	.....	380	11.80
Injuries (external causes).....	106	3.46	.....	.....	.....	.....	106	3.29
Overheight.....	1	.03	.....	.....	.....	.....	1	.03
Underheight.....	94	3.07	4	3.15	.....	.....	98	3.04
Overweight and obesity.....	20	.65	.....	.....	.....	.....	20	.62
Underweight.....	396	12.93	11	8.65	.....	.....	407	12.63
Imperfect physique.....	528	17.23	11	8.65	2	6.49	541	16.79
Mental insufficiency.....	43	1.40	6	3.93	.....	.....	48	1.49
Unclassified.....	1,438	46.93	167	131.40	.....	.....	1,605	49.82
Total.....	8,876	289.74	386	303.70	18	58.44	9,280	288.08

Number of white, colored, and Filipino applicants for enlistment examined physically during the year 1903, with the number accepted, rejected on primary examination, and declined, with ratios per thousand.

	White.		Colored.		Filipino.		Total.	
	Num-ber.	Ratio per 1,000 white ex-amin-ed.	Num-ber.	Ratio per 1,000 col-ored ex-amin-ed.	Num-ber.	Ratio per 1,000 Fili-pinos ex-amin-ed.	Num-ber.	Ratio per 1,000 ex-amin-ed.
Examined	36,634	1,000	1,271	1,000	308	1,000	32,213	1,000.00
Accepted	18,991	619.93	809	636.50	289	938.31	20,089	623.63
Rejected (on primary ex-amination)	8,876	289.74	386	303.70	18	58.44	9,280	288.08
Declined	2,767	90.33	76	59.80	1	3.25	2,844	88.28

DISCHARGES FOR DISABILITY.

During the year 1903, 1,582 soldiers were discharged because of physical disability; 1,248 became disabled after entering the service, of whom 877 were discharged for causes incident thereto and 371 for causes not so incident. Three hundred and thirty-four enlisted men were discharged for physical disabilities existent prior to enlistment. Stated in rates per thousand a total of 23.39 per thousand mean strength was discharged for physical disability of whom 5.22 were for causes existent prior to enlistment. It is apparent from these figures that more than one-fifth of the total number of such discharges were for causes existent prior to enlistment. This can not be regarded as a good showing.

It is true that with the most rigid examination some physically unfit men will be accepted. It is not believed, however, that one-third of the recruits who were afterwards discharged for disability during the year should have been passed physically. As far as known, it has been impossible to hold anyone responsible in a single case for the expenses incurred, and at a conservative estimate the Government has paid all the costs connected with the enlistment of over 200 men which would not have been incurred, or which could have been fixed on responsible officers; if medical officers of the Army had been available for the examination of recruits.

HEALTH OF THE ARMY.

The admission rate per thousand of strength of the whole Army for disease and injury during the last calendar year shows an improvement over that of 1902, the rates being 1,451.13 and 1,716.51, respectively. This reduction in the prevalence of disease and injury serves to further show the gradual improvement in the condition of the troops which has been noted since sanitary matters have been given the attention due them. Notwithstanding the fact that a mean strength of 25,379 troops were on foreign service during the year, discharges for disability numbered but 1,582, equivalent to a rate of 23.39 per thousand men, while only 629 deaths are recorded, equal to a rate of 9.30 per thousand, as compared with 23.32 and 15.49, the corresponding rates for the previous year. While the rate of discharge for disability remained as high as last year the death rate shows a decided improvement, being slightly more than half the rate of 1902. To the

comparatively small number of cases of cholera in the Philippine Islands may be attributed in no small degree the lessened rate of mortality.

The number of cases and rates per thousand of mean strength for disease in the Army reported in the calendar year 1903, were as follows: Admissions, 83,096, rate, 1,228.45; discharges for disability, 1,462, rate, 21.61; deaths, 475, rate, 7.02. Those for external causes: Admissions, 15,063, rate, 222.68; discharges for disability, 120, rate, 1.77; deaths, 154, rate, 2.28.

The admission rate in the United States per thousand for disease and injury was 1,206.89 and death rate 5.94, compared with 1,343.77 and 7.83 in 1902. Of this rate 961.50 men per thousand were admitted and 4.12 died from disease, and 245.39 admitted and 1.82 died from external causes. These rates compare most favorably with those of 1901 and 1902.

The Pacific Islands and China furnished 44,767 admissions to sick report during the year, equivalent to a rate of 1,879.54 per thousand men, of which 53 were discharged on surgeon's certificate of disability and 375 died, giving rates of 2.23 and 15.74 respectively per thousand of mean strength. These rates are less than the low figures of 1901, when the corresponding statistics for admissions and deaths were 1,928.14 and 17.96 per thousand of strength, and a vast improvement over the exceptionally high rates of last year. For every thousand men on foreign duty 1,701.28 were admitted for disease, 12.55 per thousand of which terminated fatally. For external causes only 178.27 out of every thousand were entered on sick report and the small rate of 3.19 per thousand ended in death.

From Cuba and Porto Rico 2,384 admissions to sick report were reported, equivalent to a rate of 1,527.23 per thousand of mean strength, with rates of discharge for disability and death of 19.86 and 1.92, respectively. These figures show a most satisfactory condition from a health standpoint and demonstrate clearly the results of earnest efforts on the part of those in charge of sanitary affairs affecting the health of the troops. The rate of admission from disease was 1,241.51, of discharge 19.22, and of death 1.28 per thousand men serving in Cuba and Porto Rico, while the corresponding rates for injuries were 285.72, 0.64, and 0.64 per thousand.

The small amount of cholera in the Philippine Islands, as compared with the previous year, speaks well for the untiring efforts of the Army medical officers in preventing its spread among the troops serving at the island stations. The number of posts in the Philippines has been further reduced during the year and better sanitary environments have obtained, since many of the troops have been placed in barracks and a general improvement made in the sanitary conditions of the native towns.

The sanitary improvements in the conditions of the soldiers have gradually lessened the rates of sickness and mortality since the war, and although a large proportion of the troops have been on practically war service in the Philippine Islands since 1898, the rates of sickness and mortality for the calendar year 1903 more nearly approach those of 1897—when the low death rate of 5.11 per thousand of strength for the whole Army was recorded—than at any time since the outbreak of the Spanish-American war. This is a most gratifying state of affairs,

and it is hoped that with the present sanitary knowledge put to practical energetic use a further reduction in the rates of sickness and mortality in the Army will be effected.

The food supply of the troops at home and abroad has been reported as generally good; fresh vegetables and meat are supplied, and ice is to be had at practically all military stations.

A few minor criticisms are noted relative to the clothing issued the Army, otherwise the issue is reported as fulfilling all requirements.

Barracks and quarters in the United States are, generally speaking, satisfactory; and while the overcrowding reported last year has been lessened, it will take time to construct new buildings and make the necessary repairs to the old ones in order to obtain sanitary quarters from every standpoint, and consequent diminished rates of sickness and mortality.

INVALIDING FROM THE PHILIPPINES.

From an average strength of 19,029 American troops in the Philippine Islands, 1,074 were invalided home during the year, thus giving an invaliding rate of 56.44 per thousand mean strength. There were 271 deaths among American troops in the Philippines, so that the losses by death and invaliding amounted to 70.67 per thousand mean strength. The further histories of all cases invalided in their relations to the Army have been carefully traced, with the following results:

Five hundred and thirty-nine were returned to duty; discharged: 258 on certificate of disability; 52 by expiration of term of service; 23 by order, and 6 by purchase; 8 died en route to the United States and 14 after arrival; 13 deserted, and 161 were still under treatment at the end of the calendar year. Dysentery and other intestinal diseases were responsible for nearly half of the total number invalided. Chronic dysentery alone was ascribed as the cause of invaliding in 406 cases, and enteritis in 82. The former disease was registered as the cause of 38 discharges on certificate of disability and 4 deaths, and the latter for 10 such discharges and the same number of deaths. Tuberculosis, while responsible for but 70 cases, caused 25 discharges for disability and 9 deaths. Contrary to what might be expected, in view of the general belief in reference to the prevalence and severity of malarial fevers in the Philippines, it was found necessary to send but 59 such cases home, nearly all of which subsequently went to duty, none dying. Venereal diseases were the cause of invaliding in 54 cases, syphilis being responsible for 27 of these, a majority of such cases being severe, as was shown by 18 discharges on certificate of disability. Chronic rheumatism, insanity, diseases of the middle ear, gastritis, Bright's disease, and gunshot wounds were among the other important causes for invaliding.

Cases of disease and injury among soldiers who were invalided home from the Philippines Division, together with their dispositions, in the year 1903.

	Number of cases.	Duty.	Discharged from service.				Died.		Remaining sick Dec. 31, 1903.
			Certificate of disability.	Expiration of term.	By order.	By purchase.	En route.	In the United States.	
Typhoid fever	8	6	1						1
Malarial fever:									
Intermittent	7	5			1				1
Remittent	22	18			1				3
Malarial cachexia	30	25	1		4				
Acute dysentery	10	7	3						
Chronic dysentery	406	266	38	20	8	5	3	1	8
Beri-beri	8	2	3		1		1		1
Dengue	1								1
Tuberculosis, lungs	64	4	25	1			2	6	26
Potts disease	1								1
Tuberculous abscess	1	1							
Cervical adenitis, tubercular	1								1
Tubercular arthritis	1								
Lupus, left cheek	1								1
General tuberculosis	1							1	
Syphilis, secondary	24	6	16						2
Syphilis, tertiary	3		2						1
Chancroid	4	3							1
Gonorrhea	11	6	3						1
Gonorrheal epididymitis and orchitis	2	2							
Gonorrheal ophthalmia	4		3						1
Gonorrheal rheumatism	6		4						1
Sarcoma, right inguinal region	1								1
Carcinoma, right parotid gland	1								
Chronic rheumatism and gout	34	18	10						6
Scurvy	1	1							
Diabetes	1								
Chronic alcoholism	4	2							2
Narcotic poisoning, chronic	1								
General muscular atrophy	1								1
Paralysis, cause not specified	5	1	2						2
General paralysis	1								
Insanity	35		30		1			1	3
Epilepsy	10	1	8						1
Neuralgia	5	4							1
Neuritis	10	4	6						1
Neurasthenia	6	3							1
Cephalalgia, chronic	2		2						
Encephalgia, chronic	1	1							
Impediment of speech	1		1						
Somnambulism	1		1						
Vertigo, following exposure to sun	1	1							
Masturbation	1	1							
Idiocy	1		1						
Imbecility	2		2						
Mental delinquency	1		1						
Hysteria	1	1							
Hypochondriasis	1	1							
Melancholia, acute	2	1	1						
Conjunctivitis, chronic	1	1							
Retinitis	6	1	2		1				2
Cataract	1		1						
Glaucoma	1		1						
Night blindness	3	1	1						1
Myopic astigmatism	1		1						
Hypermetropic astigmatism	1		1						
Lucoma, following ulcer of cornea	1		1						
Diseases of the middle and internal ear	30	4	17	3					6
Chronic endocarditis	1		1						
Tachycardia	1		1						
Aortic regurgitation	2		2						
Aortic insufficiency and stenosis	1								1
Mitral regurgitation	5	1	3						1
Mitral regurgitation, failing compensation	2			1				1	
Mitral regurgitation, aortic stenosis	1		1						
Cardiac hypertrophy	1		1						
Mitral and aortic regurgitation	2		2						
Cardiac irritability	3	6	2						
Aortic stenosis	1								1
Hemorrhoids	1	1							

a Includes cases remaining from last year.

Cases of disease and injury among soldiers who were invalided home from the Philippines Division, together with their dispositions, in the year 1903—Continued.

	Number of cases.	Duty.	Discharged from service.				Died.		Deserted.	Remaining sick Dec. 31, 1903.
			Certificate of disability.	Expiration of term.	By order.	By purchase.	En route.	In the United States.		
Chronic nasal catarrh.....	2	1	1							
Nasal polypus.....	1									
Disease of the thyroid body.....	1		1						1	
Acute bronchitis.....	2	3								
Chronic bronchitis.....	8	5		2	1					
Pleurisy.....	4	1	1					1		1
Asthma.....	8	3	4		1					
Pulmonary emphysema.....	1	1								
Diseases of the esophagus.....	2		2							
Gastritis.....	30	20		4						4
Diarrhea, acute.....	1		1							
Diarrhea, chronic.....	3	3								
Enteritis.....	82	54	10	2	4		2	2	2	2
Ankylostomiasis.....	8	5	1							6
Inguinal hernia.....	9	6	2	1						
Fistula in ano.....	1	1								
Chronic constipation.....	5	2	1						1	1
Ichio-rectal abscess.....	1	1								
Pains following operation for appendicitis, due to adhesions.....	1		1							
Acute hepatitis.....	1		1							
Hepatic abscess.....	4	2						2		
Jaundice, catarrhal.....	1	1								
Acute nephritis.....	2	1		1						
Bright's disease.....	12	5	1	1						5
Renal calculi.....	1		1							
Cystitis.....	2	2								
Urethral fistula, scrotal.....	1									1
Acute abscess, plegmon.....	1	1								
Ulcer.....	3	3								
Osteo myelitis.....	1					1				
Periostitis.....	1									1
Talipes planus, left foot.....	1									1
Arthritis.....	1		1							
Synovitis.....	4	1	2	1						
Ankylosis.....	3	1	2							
Bursitis.....	1	1								
Muscular rheumatism and myalgia.....	2	2								
Senile debility.....	1	1								
Malingering (sciatica and Pott's disease, earlier diagnosis).....	1	1								
Fractures, exclusive of gunshot.....	9	2	2	1						4
Dislocations.....	1									1
Wounds:										
Incised.....	9	1	6	1						1
Lacerated.....	2		1	1						
Punctured.....	1		1							
Gunshot.....	18	2	13	1						2
Other traumatisms.....	2		1							1
Total.....	1,074	639	258	52	23	6	8	14	13	161

RACIAL PREVALENCE OF DISEASE AND INJURY IN THE ARMY IN 1903.

The mean strength of the whole Army for the year 1903 of 67,643 men consisted of 59,671 white troops, 3,183 colored, and 4,789 native Filipinos.

The admission rate of the Army for disease and injury during the year was 1,451.13 per thousand of strength, with rates of discharge for disability and death of 23.39 and 9.30, respectively. Of the total number of admissions those of white troops constituted a rate of 1,480.15 per thousand of strength, of which 25.02 per thousand were discharged for disability and 8.21 per thousand died. The negro troops show an admission rate per thousand of 1,025.76, with 12.57

discharged and 11.31 deaths per thousand, compared with 1,372.32, 10.23, and 21.51, the corresponding rates for the native Filipinos.

The negroes, therefore, show the lowest figures in sickness, while the white troops had much the lowest mortality and the most sickness. The Filipinos had the highest mortality rate, almost double that of the negroes, and an admission rate which closely approached the high rate of admission of the white troops.

In admissions for injuries, as in 1902, the Filipino soldiers were singularly fortunate, having a rate in 1903 of only 87.29 per thousand men. On the other hand the rate of mortality of 3.34 per thousand is almost as large as the combined death rates of white and colored troops from external causes. For these causes the negroes led with an admission rate of 255.42 per thousand, compared with 231.80 per thousand for the white troops. White troops to the extent of 2.21 per thousand and colored to that of 1.89 per thousand died of injuries during the year.

The Filipinos show the highest rate of admission for disease during the year, when 1,285.03 men per thousand were entered on sick report. White troops very nearly reach that rate with admissions of 1,248.34 per thousand, while colored troops had the low admission rate of 770.34 per thousand. The low rates among the negroes may be accounted for in part by the fact that no colored troops were on duty in the Philippine Islands during the year. In deaths from disease the Filipinos again led with the high rate of 18.17 per thousand, compared with 6 per thousand for white troops and 9.42 for colored.

The percentage of measles among white troops was 7.63 per thousand men, while only 1 case was reported among the negro troops and 3 among the Filipinos. White troops also led in admissions for mumps, with 7.81 cases per thousand, colored troops 1.26, and Filipinos 4.59 per thousand.

In admissions for consumption, the Filipinos slightly exceeded the negroes, having rates of 7.94 and 6.27, respectively, while the admission rate for white troops is a little more than half that of the colored troops, the latter having the high mortality rate of 4.39 per thousand men. In smallpox the Filipinos led with 1.46 per thousand admissions, while no great difference in its prevalence was observed between the white and colored troops. For typhoid fever the admission rates for negroes and Filipinos were about one-fourth of that for white troops, who were admitted to the extent of 5.66 per thousand men, with a mortality rate of 0.47 per thousand. There was 1 death reported among Filipinos and 1 among the colored troops from this cause.

Malarial fevers again caused considerably higher rates of sickness and death among Filipinos than among the white and colored troops of American birth. They had the high admission rate of 531.22 and death rate of 2.51 per thousand, compared with 183.42 and 0.36 for the white, and 37.39 with no death for the colored soldiers from these fevers. The admission rate for the scouts is lower, but the death rate exceeds that of 1902, when only 1.66 men per thousand died.

The negro troops were entirely free from dengue, while the rates of admission for the white and Filipino soldiers vary but slightly. For Asiatic cholera 105 cases, equivalent to a rate of 1.76 per thousand, with 68 deaths, or a rate of 1.14 per thousand, were reported among the white troops and 44 admissions, and 28 deaths, with rates equivalent to 9.19 and 5.85 per thousand men, respectively, were recorded among

the Filipinos, while the colored troops were entirely free from the malady.

Beri-beri, as during the previous year, was almost entirely confined to the Filipino soldiers, who gave an admission rate of 128.21 per thousand men, 4.59 in every thousand terminating fatally. There were 3 deaths from this cause among the white troops. Of venereal diseases the scouts show less than one-half the prevalence compared with colored troops, while the admission rate for white troops was 161.13 per thousand men. The Filipinos again demonstrated their freedom from drunkenness, as only 3 admissions from that cause are recorded, compared with 27.27 admissions per thousand for white troops and 12.56 for colored.

The admission rate for white troops from dysentery was 41.06 per thousand men, of which 0.79 of every thousand resulted fatally, compared with 5.97 and 0.31 and 17.12 and 0.42, the corresponding rates per thousand for colored and Filipino troops, respectively. The Filipino troops with an admission rate of 106.07 nearly approached the rate of white troops for acute and chronic diarrhea and enteritis; from the latter were reported the only deaths from these causes, the rate being 0.23 per thousand men. The colored troops suffered but slightly from these diseases.

In the diseases of the nervous system the Filipino troops show a rate of admission per thousand equal to about one-third of the rate reported for white troops, who had 24.57 men out of every thousand admitted for these affections, while colored troops to the extent of 19.79 per thousand were admitted to sick report for the same causes. The latter led the white troops in mortality rate from nervous diseases, while the Filipino soldiers lost 0.42 men per thousand of strength, a rate slightly in excess of either that for the white or colored troops.

As only a part of the total number of American-born troops served in the Philippine Islands during the year and were thus exposed to some of the most serious maladies which prevail only in that country, and as all the scouts were exposed, the following tabulation is given for a further and more exact comparison of diseases existing among the troops serving in those islands:

Special diseases in Pacific Islands and China, 1903, by races, admissions, and deaths with ratios per thousand of strength.

	White.				Filipinos.			
	Cases.	Ratio.	Deaths.	Ratio.	Cases.	Ratio.	Deaths.	Ratio.
Malarial fevers.....	8,379	440.33	20	1.06	2,544	531.22	12	2.51
Beri-beri.....	21	1.10	3	.16	614	128.21	22	4.59
Dengue.....	2,305	121.13			145	30.28		
Typhoid.....	94	4.94	17	.89	5	1.04	1	.21
Smallpox.....	20	1.05	3	.16	7	1.46		
Acute dysentery.....	1,472	77.36	25	1.31	72	15.03	1	.21
Chronic dysentery.....	584	30.69	16	.84	10	2.09	1	.21
Acute diarrhea.....	4,525	237.79	1	.05	493	102.94		
Chronic diarrhea.....	109	5.73	2	.11				
Cholera.....	105	5.52	68	3.57	44	9.19	28	5.85
Nervous system.....	524	27.54	7	.37	41	8.56	2	.42
Respiratory system.....	1,145	60.17	3	.26	288	60.14	4	.84
Genito-urinary system.....	403	21.18	5	.26	48	10.02		
Diseases of skin.....	3,089	162.34	2	.11	512	106.91		
Diseases of organs of locomotion.....	790	41.52			102	21.30		
Hepatic abscess.....	11	.52	1	.05	2	.42	2	.42
Catarrhal jaundice.....	72	3.78			3	.63		
Acute hepatitis.....	6	.32			1	.21		
Intestinal parasites.....	75	3.94						

No colored troops on duty in the Philippine Islands during the year.

SEASONAL PREVALENCE OF DISEASE.

With a mean monthly admission rate of 120.93 for disease and injury in 1903, the seasonal curve for the Army as a whole began in January with the high rate of 140.36 per thousand of strength. It fell considerably in February, only to be slightly increased in March, when 129.98 per thousand men for the whole Army were admitted to sick report during the month, with 0.79 deaths per thousand for the same period. In April, May, and June the rate was further reduced, but a slight increase is noted in the rates for the following two months, then a gradual decrease until the minimum was reached in December, when 104.20 admissions per thousand were recorded on the reports of sick and wounded. The maximum rate of mortality was reported in January, when 1 death occurred in every thousand of mean strength, while the minimum death rate of 0.58 per thousand of strength was recorded in June. The maximum and minimum of those constantly sick were reported in January and December, respectively.

During the past year the curve of prevalence of disease and injury among troops serving at home stations was not changed considerably from the characteristic curve of former years. The mean monthly rate of admission per thousand of strength was 100.57, with a mortality rate of 0.50 per thousand. January, February, and March show high rates of admission per thousand of strength, with the maximum rate of 112.57 for the year recorded in March and the minimum of 87.50 per thousand reported in June. Of the mortality rates for the twelve months the maximum of 0.57 per thousand was reported in April and the minimum in June. Of the mean strength serving at home stations 48.49 men per thousand were constantly on sick report.

In the Pacific Islands and China the mean monthly rate of admission was 156.63 per thousand, the maximum rate of 192.38 per thousand being recorded in January and the minimum of 106.77 in December. The number constantly on sick report was 66.16 per thousand men for the year, while the largest mortality rate of any one month occurred in January when 2.13 men died out of every 1,000 serving in the islands and China. The minimum death rate was reached in December when but 0.78 men died per thousand of strength.

In Cuba and Porto Rico the maximum monthly admission rate occurred in October when 145.54 men per thousand of strength were admitted to sick report and the minimum in December when 102.21 per thousand were reported. The mortality rate was very low in these islands. Deaths occurred in only three months of the year, and the low average monthly rate of 0.16 per thousand of strength was recorded. The constantly sick for the twelve months constituted 51.50 per thousand of strength.

Statistical table No. 2 shows in detail by months for the different regions the admissions, deaths, and constantly sick, with rates per thousand of mean strength.

PREVALENCE OF SPECIAL DISEASES.

SCARLET FEVER.

Eleven cases of this disease appeared among the enlisted men of the Army, mean strength 67,643, during the calendar year 1903. None of these cases were fatal. All admissions for this disease occurred

I recommend that the work of screening all barracks and quarters, manholes, ventilator openings, barrels, etc., containing standing water, be pushed vigorously, and post commanders be required to report progress and completion of the work, and whether it has been done in such a manner as to be thoroughly effective.

That all occupants of quarters and all organization commanders be held strictly accountable for the proper use of screens and for the protection of all standing water on their premises.

That the police officers of each post be held personally responsible for the proper draining, filling, or protection by oiling of all accumulation of water outside of premises, for the removal of all possible receptacles, such as old cans, crockery, etc., and the proper condition of surface drainage, etc.

That the senior medical officer at each post keep himself in touch with the local health authorities, keep himself posted as to the prevailing diseases in his locality, and endeavor to secure cooperation in carrying out these measures in adjacent civil communities.

Should yellow fever develop in the adjacent communities, soldiers and their families and officers' servants should not be allowed to visit the towns, nor should officers and their families be allowed to do so except on business. Ordinary business communication may go on, but no visitors should be received in any occupied houses.

Two mosquito-proof rooms with wire-gauze ceiling, seven feet from the floor, should be prepared at or near the hospital, the one for the reception of suspicious cases and the other for the treatment of yellow-fever cases.

Very respectfully,

CHAS. F. MASON,

Major, Surgeon, U. S. Army, Acting Chief Surgeon.

THE ADJUTANT-GENERAL, DEPARTMENT OF TEXAS.

CIRCULAR }
No. 17. }

HEADQUARTERS DEPARTMENT OF TEXAS,
San Antonio, Tex., September 4, 1903.

The following communication is published for the information of this command. Surgeons of posts are directed to carry out in detail the recommendations contained therein.

By command of Brigadier-General Grant:

S. W. TAYLOR,

Lieutenant-Colonel, Artillery Corps, Adjutant-General.

HEADQUARTERS DEPARTMENT OF TEXAS,
CHIEF SURGEON'S OFFICE,
San Antonio, Tex., September 3, 1903.

SIR: In view of the possibility of yellow fever crossing the border from Mexico, I have the honor to recommend that surgeons be directed to exercise vigilance in protecting their commands from infection, and to be prepared to stamp it out promptly should it occur.

All suspicious cases of fever should be confined in the "suspicion ward," their pulse and temperature taken every four hours, and urine examined twice daily.

Should an undoubted case occur the patient should be removed to the "yellow-fever ward," the house occupied by him emptied and every room in it carefully fumigated, after closing it tight and pasting up all cracks and openings. Adjoining houses on both sides are then fumigated in the same way.

To kill the infected mosquitoes by fumigation, sulphur, 4 pounds per 1,000 cubic feet of air space, or pyrethrum, 1 pound per 1,000 cubic feet, should be burned; as some mosquitoes will recover after the use of pyrethrum, the room should be opened after three hours and the stupefied insects swept up and burned.

Surgeons who have not a sufficient supply of sulphur on hand should make immediate requisition for it.

Should wire screens not be provided in time, mosquito netting should be used in screening.

Attention of surgeons should be invited to paragraph 166, Manual for the Medical Department, 1902; to Circulars 9 and 15, current series, Headquarters Department of Texas; to "Mosquito work in Havana" (Gorgas), Medical Record, July 19, 1902, and to Circular No. 5, 1901, headquarters Department of Cuba, as published in Report of the Surgeon-General of the Army, 1901.

The report called for in paragraph 166, Manual for the Medical Department, should be made by telegram.

Very respectfully,

CHAS. F. MASON,
Major, Surgeon, U. S. Army., Acting Chief Surgeon.

The ADJUTANT-GENERAL, DEPARTMENT OF TEXAS.

On September 15, in response to a telegram from the surgeon at Fort McIntosh informing department headquarters of the presence of yellow fever at Nuevo Laredo, Mexico, just across the Rio Grande from that post, Major Mason visited Laredo and satisfied himself of the existence of yellow fever in Nuevo Laredo, although the presence of the disease was denied by the Mexican authorities, who called the prevailing fever dengue. At that time, according to the local health authorities, neither yellow fever nor dengue existed in Laredo, Tex., though it is now known that they were mistaken in regard to the former disease.

Upon the discovery of yellow fever at Nuevo Laredo, Fort McIntosh was at once quarantined against both Laredos, as directed in Circulars 15 and 17, Headquarters Department of Texas. On September 25 yellow fever was officially reported at Laredo, Tex. The following tables give the yellow-fever cases and a record of the temperature at Laredo from that date to November 30, 1903, when the epidemic was considered closed:

Numerical report of yellow-fever cases and a record of the temperature at Laredo, Tex., from September 25 to November 30, 1903.

	Yellow-fever cases.	Deaths.	Foci.	Record of temperature.	
				Mean maximum.	Mean minimum.
September.....	32	1	26	80.6	70
October.....	571	51	491	85.9	59
November.....	418	51	404	76	50.2
Total.....	1,051	103	921	80.8	59.6

	Cases.	Deaths.	Per cent.
American.....	359	8	2.22
Mexican.....	692	95	13.72
Both nationalities.....	1,051	103	9.8

In December, 1903, 26 more cases occurred, with 4 deaths, thus making the total number of cases for the year 1,077, of which 107 were fatal. One nonfatal case was also reported on January 2, 1904.

The methods adopted to prevent the spread of the disease in Laredo were based on those so successfully executed in Havana by Col. William C. Gorgas, assistant surgeon-general, U. S. Army. This was done under the direction of the Public Health and Marine-Hospital Service, which cooperated with the State health officer, Dr. George R. Taber. By the former mosquito nets were furnished and houses screened, houses were fumigated with sulphur for the destruction of mosquitoes, water containers were carefully inspected for the existence of larvæ and were oiled with crude petroleum, and all houses and premises were thoroughly inspected. The latter compelled the inhabitants to strictly observe all of the sanitary rules concerning the destruction of mosquitoes and their larvæ and the early report of all

fever cases by the physicians in attendance. No hospital was established by either State or Federal authority, and as the city of Laredo had but two free beds in a hospital, with very few exceptions all cases were treated in private residences. Under these conditions and because of the superstition and ignorance of the Mexican population much difficulty was encountered in preventing the spread of the disease.

During the epidemic at Laredo Dr. R. P. Ames, contract surgeon, U. S. Army, was in direct charge of the sanitation of Fort McIntosh, and is entitled to much credit for his careful management of the situation in a manner which not only protected the post but at the same time interfered to the least possible limit with the routine of its garrison.

In the latter connection it should be mentioned that soldiers and others were by no means absolutely debarred from visiting Laredo, but went into its worst infected district, both by day and night, so long as they wore head nets, gauntlets, and leggings to protect them from the bites of mosquitoes. On account of the nearness of the town to the post, the same equipment was provided for sentries while walking post.

During the epidemic a detention camp was established at Fort McIntosh, from which fifty discharged soldiers, after inspection by the local health officer, were allowed to depart for their homes.

The date on which the first person was attacked by yellow fever in San Antonio can not be determined. Major Mason reports that he was unable to satisfy himself of the actual existence of the disease in that city until the 20th of October, on which date department headquarters and Fort Sam Houston were quarantined in accordance with his recommendation.

This quarantine, which was an absolute one, was maintained until November 19. There then having been no case reported for ten days and the weather being very cold, ice forming for two successive nights, the quarantine was raised from 6 a. m. to 6 p. m. daily, on the promise of the physicians of the advisory committee that the Havana method would be followed.

The measures taken for the protection of troops in the Department of Texas have been based entirely upon the mosquito law of transmission, and have been eminently successful. The posts of Forts Sam Houston and McIntosh are situated within the corporate limits of San Antonio and Laredo, respectively, and are surrounded on four sides by those cities. At Fort Sam Houston, notwithstanding the numerous cases of yellow fever in San Antonio, but one case of this disease was contracted, this being before the quarantine, the patient having taken to his bed the day following. In Laredo, with its 1,078 cases, there were but five cases in the post, and in each instance the soldier had visited an infected house without the head net, gauntlets, and leggings prescribed by order. No secondary cases developed in either post.

On the termination of the Texas epidemic the acting chief surgeon of that department submitted a report from which the following extract is taken:

The posts in the department are practically safe until next spring, when danger is to be apprehended from recurrence at Laredo and San Antonio, and from new invasion at Forts Brown, Ringgold, and Eagle Pass. Mexico is undoubtedly widely infected, and, as far as can be learned, proper methods are not being taken to control the disease there.

New railroads, which are expected to be completed into Brownsville, Tex., early next spring, will place Forts Brown and Ringgold in direct railroad communication with Tampico and Linares, both badly infected points in Mexico. The situation would seem to demand that steps be taken for an international arrangement to protect this country now seriously threatened from Mexico.

All the posts in this department have been thoroughly screened, and at each one an active campaign has been instituted to leave no place where it would be possible for mosquitoes to breed.

In March, 1904, in order that a timely and united effort might be made for the destruction of mosquitoes at all Texas posts, an additional circular was published as follows:

CIRCULAR.]

HEADQUARTERS DEPARTMENT OF TEXAS,
San Antonio, Tex., March 24, 1904.

Upon recommendation of the chief surgeon of the department, the following is published for the information and guidance of all concerned:

Each householder, organization commander, and responsible officer will be held strictly accountable for any mosquito-breeding places found on the premises under his charge and for any violation of these rules.

Yellow fever and malarial fever are conveyed always and only by the bite of the mosquito. The mosquitoes found about a house are pretty sure to have been bred on the premises.

Mosquitoes breed only in standing water, the smallest collection being sufficient for the purpose. The eggs, laid on the surface of the water, hatch out the larvæ or "wigglers" in about twenty-four hours, and these develop into pupæ in five or six days, and in a day or two more into the full-fledged mosquito, the entire process from egg to mosquito requiring only a week or ten days.

The wigglers come to the surface of the water to breathe every few minutes, but if the surface of the water is covered with a film of petroleum, they are unable to breathe through it, and are killed, hence the following rules:

1. Examine every part of your premises for standing water at least twice a week, and get rid of it as far as possible. Pay especial attention to leaking hydrants, ice-box overflows, watering troughs, fire buckets, old barrels, cellars, unused water-closets, or anything capable of holding water.

2. Empty and dry in the sun, at least twice a week, all water receptacles which are indispensable, or pour upon the surface of the water petroleum or kerosene, two tablespoonfuls to each 15 square feet of surface.

3. Report, at least twice a week, to the police officer or a medical officer, any stagnant water on your premises or in your neighborhood, which you can not remedy yourself, until the nuisance is abated.

4. Sleep under a mosquito net, whether day or night, and remember that a net with holes or one improperly tucked in is worse than none at all.

5. Mosquitoes, which otherwise might be blown away by the winds, are sheltered by vines, long grass, and weeds, which should be dispensed with.

6. Read over these rules at least twice a week and see if you have neglected something that should have been done.

By order of Colonel Hughes:

WALTER L. FINLEY,
Major, Assistant Adjutant-General, Adjutant-General.

Returning to discuss the 5 cases of yellow fever which were treated at Fort McIntosh, a brief history of each is here given:

Yellow fever cases among soldiers, violators of standing quarantine rules.

Name.	Rank.	Com- pany.	Regiment.	Age.	Nativ- ity.	Date of attack.	Diagnosis.	Jaundice.
T. O'C....	Private....	F.....	Twenty-sixth ..	23	Pa.....	1903. Oct. 27	Yellow fever.	Intense, deep.
O. A. O....	Artificer....	E.....	do.....	26	Minn.....	do.....	do.....	No jaundice.
J. H. P....	Private....	E.....	do.....	23	Ill.....	Nov. 3	do.....	do.
D. L. D....	do.....	F.....	do.....	30	Mass.....	Nov. 9	do.....	Moderate.
J. H. O'B.	do.....	F.....	do.....	28	Conn.....	do.....	do.....	No jaundice.

Yellow fever cases among soldiers, violators of standing quarantine rules—Continued.

Name.	Type.	Recov- ery.	Dura- tion of fever.	Date of dis- charge.
			Days.	
T. O'C....	Intense infection; urine solid with albumin; bile stain granular casts; one convulsion.	1	13	Nov. 30, 1903.
O. A. O....	Moderate infection; small deposit of albumin	1	7	Nov. 15, 1903.
J. H. P....	Slight infection; trace of albumin	1	5	do.
D. L. D....	Severe infection; 80 per cent albumin; bile stain granular casts.	1	8	do.
J. H. O'B.	Very mild infection; faint trace of albumin.....	1	4	do.

No hemorrhages. All alcoholic except O. A. O.

Doctor Ames, who treated these cases, permits his patients no food until six hours after the temperature is normal, when he considers convalescence established and allows small quantities of iced milk. In a long case, after the sixth day, provided temperature is on the decline or the patient complains of weakness, 15 to 30 c.c. of iced champagne is given every two hours, for its action as a food and stimulant. Oil of turpentine 0.3 c.c. is prescribed in capsules every two hours from the very beginning of the attack until four days after convalescence. The oil is placed in capsules, drop by drop, at the time of administration. Doctor Ames believes turpentine a specific in yellow fever, it acting both as a strong diuretic and a powerful hemostatic, by its latter properties preventing the oozing of blood from the internal organs and mucous surfaces.

In February, 1904, at my request, Col. W. C. Gorgas, assistant surgeon-general, U. S. Army, prepared a paper entitled "A few general directions with regard to destroying mosquitoes, particularly the yellow-fever mosquito," 10,500 copies of which were printed later on authority of Congress. The directions were expressed in simple, nontechnical language, as the pamphlet is intended for general distribution. Colonel Gorgas has had a vast practical experience in combating yellow fever, and his publication should enable the people of Texas and of our other States on the Gulf coast to proceed intelligently for the protection of themselves and their communities, and should free their minds from the unreasoning dread of yellow fever now too frequently deeply implanted there.

At the time of the publication of my last annual report it appeared probable that recent investigation had resulted in the demonstration of the actual germ of yellow fever in the bodies of infected mosquitoes of the family *Stegomyia*.

Immediately on issue of the bulletin on this subject First Lieut. James Carroll, assistant surgeon, U. S. Army, whose name has been associated with the history of yellow fever from the beginning of the investigation by the army board which conclusively proved the mode of its transmission, began a careful study of the results reported.

This, unfortunately, was not confirmatory, and he prepared a paper on his investigations, which was read at the Thirty-first Annual meeting of the American Public Health Association, held at Washington, D. C., October 26-30, 1903.

In this paper, which is entitled "The Etiology of Yellow Fever" (an addendum), Doctor Carroll says, in conclusion:

1. The fusiform stage of the so-called *Myxococcidium stegomyia* of Parker, Beyer, and Pothier (1903) is not connected in any way with the transmission of yellow fever.

2. This organism appears to be not a protozoan parasite, but a yeast fungus. In its fusiform stage, the only form in which it was constantly present, it shows the characteristic budding, staining affinities, and vacuolation or spore formation of a blastomycete, and it is found with considerable regularity in both male and female mosquitoes that have purposely been fed on over-ripe banana to which a pure culture of a wild yeast had been added in the laboratory.

3. The organism has not hitherto been found in repeated examinations of mosquitoes of the genus *Stegomyia* that have bitten yellow-fever patients in the early stages of the disease, when such insects had been fed only on blood, dry sugar, and water. This statement applies also to mosquitoes that are known to have reproduced the disease in human beings.

Doctor Carroll's findings have received general credence from the scientific world, and while very few now doubt that the mosquito is the sole agent in the transmission of yellow fever, the parasitic cause of this disease is still unknown.

DIPHTHERIA.

Twenty-six cases, equal to an admission rate of 0.38 per thousand, with no death or discharge, were recorded during this year. All cases of this disease occurred among the white troops serving in the United States.

MALARIAL FEVERS.

In the Army as a whole during the last year 13,608 cases, equivalent to a rate of 201.18 per thousand, were reported, with 5 discharges and 34 deaths, equal to 0.07 and 0.50 per thousand of strength respectively, which compares favorably with the prevalence of malarial fevers in 1902, when 21,996, or 272.30 cases per thousand, were admitted to sick report, with a death rate of 0.45 per thousand of strength.

The following shows the character of these diseases:

Intermittents: 11,230 cases, equivalent to 166.02 per thousand men, with no death and no discharge for disability.

Remittents or continued: 2,066 cases, equal to 30.54 per thousand of strength, with 4 deaths, and no discharge for disability.

Pernicious fevers: 41 cases, equivalent to 0.61 per thousand of strength, with 28 deaths and no discharge.

Malarial cachexia: 271 cases, equal to 4.01 per thousand men, with 5 discharges and 2 deaths.

The following table shows the ratios of admission per thousand strength for malarial disease in the different countries:

	Pacific Islands and China.			Cuba and Porto Rico.			United States.		
	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.
Intermittents.....	377.61	.....	.....	60.86	.....	.....	50.66	.....	.....
Remittents or continued.....	72.17	.....	0.17	10.89	.....	.....	7.81	.....	.....
Pernicious.....	1.55	.....	1.09	.64	.....	.....	.07	.....	0.06
Cachexia.....	7.26	.....	.08	.64	.....	.....	2.30	0.12	.....

Based on our knowledge of the means by which these diseases are propagated by infected mosquitoes, practical application of the method of prevention of malarial diseases has been continued at the different posts during the past calendar year. Mosquito bars are in general use,

especially at hospitals, and the use of petroleum to prevent the breeding of mosquitoes has been carried on with varying degrees of success at a number of stations during the year.

At Fort Sam Houston, Tex., in addition to the antimosquito work, which has been unremittingly carried on, all malarial cases, however mild, are treated in hospital under a mosquito net, thus eliminating a source of infection to others of the command. After admission this class of cases is retained in hospital until the parasites have disappeared from the peripheral blood and all symptoms have ceased. When a patient recently suffering from malaria leaves hospital his name is entered on the "malarial register" and he is instructed to report at sick call once a week thereafter until released by the medical officer. On the day he reports his blood is examined and he is given one gram of quinine. If *exiguus* are found he is directed to report again the next day for a second dose. This course is repeated once a week for two months, or longer if necessary.

In the Philippine Islands measures relative to the prevention of malaria were diligently practiced at all military stations. At frequent intervals the breeding places of mosquitoes have been carefully sought and properly attended to as the local conditions warranted. The recommendations as to use of mosquito-bugs in barracks, hospitals, quarters, and gunhouses have been rigidly enforced, besides the periodic collection and burning of refuse to all malarial cases, showing a tendency to recurrence. Special care has been given to the protection of malarial patients, that the mosquitoes of the different localities might not become infected and thus be enabled to propagate the disease to another section of the island. As a result of the antimosquito efforts the only admission to sick report for malarial afflictions in the Philippine Islands during the calendar year 1910 was a constabulary sergeant. The patient was a young man who was admitted to the hospital on October 12, 1910, with the following symptoms: Headache, fever, chills, and sweats. The patient was treated with quinine and was discharged on October 20, 1910, and returned to his post. The patient was not re-admitted to the hospital.

CHOLERA.

During the year 1910 no cases of cholera were reported from any of the military stations in the United States. The only case of cholera reported from the Philippines during the year 1910 was a constabulary sergeant who was admitted to the hospital on October 12, 1910, with the following symptoms: Headache, fever, chills, and sweats. The patient was treated with quinine and was discharged on October 20, 1910, and returned to his post. The patient was not re-admitted to the hospital.

The character of the measures taken to prevent the disease may be judged from the following circular:

CIRCULAR 1
No. 62. 1

HEADQUARTERS OF THE ARMY,
ADJUTANT-GENERAL'S OFFICE,
Washington, December 24, 1902.

By direction of the Secretary of War, the following memorandum, prepared by the Surgeon-General of the Army, upon the subject of typhoid fever contagion and the means of preventing it is published to the Army for the information and guidance of all concerned.

Personal hygiene for the prevention of typhoid fever in camps.—Typhoid fever is a very common disease in the United States and is particularly liable to spread among soldiers in camp and garrison because of the intimate association of men gathered together in barracks and tents. It is conveyed by the fecal and urinary discharges of persons suffering from the disease.

It often happens that a soldier suffering from typhoid fever remains on duty for several days before he seeks relief at the hospital. Furthermore, very mild cases occur which are never treated as such.

The disease is not contagious in the sense that the mere presence of a case determines contagion, as in smallpox or measles, but particles of human excrement containing the germ of the disease may in many ways be transferred from the sick to the well and cause typhoid fever. In this sense it is contagious.

That an infected water supply is a common cause of the disease is well known, but it is likely that in camp life a greater number of cases occur from direct contagion, man to man, than from infected drinking water. It is not probable that several hundred men can be assembled in a camp without at least one case of typhoid fever being introduced from outside and this case may not be recognized until infection of others has taken place. Therefore, the immediate destruction or disinfection of the discharges of all persons in camps without sewers is an imperative necessity.

The fever may be spread by flies from infected excrement settling on articles of food in company kitchens and in other ways, also, by dust containing dried particles of infected matter.

Therefore, wilful or careless soiling of the neighboring ground by excrement or urine should be counted a serious military offense, as it is quite possible for a single instance of this kind to cause the sickness or death of many comrades.

The disease can be easily transmitted by dirty hands, soiled clothes, filthy playing cards, and numerous other ways by which very minute particles of human ordure may obtain entrance to the mouth.

Therefore the personal cleanliness of men in camp should be a matter of gravest concern to officers and noncommissioned officers exercising authority, and every soldier should be instructed in the very simple principles governing infection by personal uncleanness. The weekly bath should be insisted on and facilities furnished for it. Daily bathing should be encouraged whenever possible.

Washing the hands with soap and water, and the use of individual nail brushes after going to the sinks and before meals, is a necessity in camp life if danger to health is to be avoided.

The use of toilet paper is essential to personal cleanliness, and each soldier should at all times have a supply with him.

Soldiers using underclothing, towels, paper, nail brushes, etc., which have been used by other men, do so at the risk of infection. Clothing and bedding soiled by discharges from the body should instantly be washed or, if wooden, disinfected.

Complete protection of food from contamination by flies, dust, and promiscuous handling should be had at all costs.

When a case of typhoid fever is removed from a tent the site, the canvas, and the articles within the tent should be disinfected.

With simple precautions cases of typhoid fever may be and are handled by nurses and attendants in hospitals without danger to themselves.

With all such precautions on the part of all men, typhoid fever, once introduced into camp, will undoubtedly spread.

By command of Lieutenant-General Miles

H. C. CONNIS,
Adjutant-General, Major-General, U. S. Army.

It is gratifying to be able to report an increasing appreciation among line officers generally of the necessity for careful sanitary administration as a means of protecting the Army against this formidable disease.

Statistics for the year by arms of service show the engineers to have had the highest admission rate, 12.03 per thousand, followed by the cavalry, 8.68, and the field artillery, 6.51. The Medical Department and hospital corps together had an admission rate of 5.64, which is slightly above the rate for the whole Army. As this department and corps are stationed wherever the Army may be, thus serving under the same conditions as it does, and in addition, from the nature of their duties, are especially exposed to contact infection from this disease, the danger of which has attracted considerable attention of late, their comparatively low rate must be accepted as satisfactory and as an indication that the methods taken to protect them from infection in hospitals have been given careful attention.

By races the whites showed an admission rate of 5.66 per thousand, death rate 0.47; colored, admission rate 1.57, death rate 0.31 and Filipinos, admission rate 1.04, death rate 0.21. All the colored troops have had home stations during the year where, as will be seen, the admission rate for typhoid was much higher than for troops serving outside of the United States, which would make this difference between them and the whites even more remarkable if it were not for the fact that the distribution of the disease among the stations in the United States is by no means an equal one, and the colored troops have chanced to garrison posts where the liability to typhoid infection is not great. The very low admission rate of the Philippine Scouts is notable, as it always has been since these organizations were formed.

In the United States, with a mean strength of 42,264, 246 cases of typhoid have been treated during the year, of which 12 have died, giving an admission rate of 5.82 per thousand and a death rate of 0.28. Cuba and Porto Rico together, mean strength 1,561, had 3 admissions and no death, admission rate 1.92 per thousand. The Philippine Islands, mean strength 23,460, showed 87 admissions, and 16 deaths or rates per thousand of 6.71 and 0.68, respectively. Pekin, mean strength 145, had 11 admissions, rate per thousand 78.86, and deaths 1, rate 6.90. Hawaii, mean strength 213, gave 1 case and 1 death, admission and death rates per thousand 4.69.

The American troops serving in the Philippines with a mean strength of 18,671, had 82 typhoid cases and 15 deaths, equivalent to an admission rate of 4.66 and a death rate of 0.80 per thousand of strength, while the Filipinos with a mean strength of 4,789 had 5 admissions and 1 death or rates of 1.04 and 0.21 per thousand, respectively.

The records of the past year afford further proof that whatever faults the Philippine Islands may possess as a station for troops, from the standpoint of health, liability to typhoid infection is not one of them. Why this should be so is not so evident. Generally armies in tropical countries certainly do not enjoy immunity from typhoid fever; taking India for example, in 1901, the best year since 1887, the rates per thousand for European troops were 12.8 admissions and 3.32 deaths. Granting that the habits of the natives of India are such as to pollute the sources of their water supply, it is inconceivable that this is done to a greater extent than in the Philippines, where the large majority of wells and streams are grossly contaminated. This is apparent not only on inspection and from the results of bacteriological and chemical examinations, but from the numerous cases of dysentery and cholera which follow the use of unsterilized water. Yet under

field-service conditions, when the use of sterilized water only can not always be enforced, typhoid rates do not markedly increase.

It has been suggested that cases diagnosed as malarial fever are, in reality, typhoid, and the higher death rate in the Philippines might be held to lend some color to such an assumption; but, as a matter of fact, it is possible to put into general use there the usual scientific methods of differentiation between these two diseases, and this is generally done; moreover the higher death rate of typhoid may be more easily explained by the reduced resisting power of men serving in a tropical climate and the increased difficulties of treatment of this disease in which good results are notoriously dependent upon the best surroundings.

The reason for the infrequent appearance of typhoid fever among troops in the Philippines is undoubtedly due in a large measure to its rarity in natives. The cause of its limited spread among the inhabitants, carried as it is in the same way as cholera, which runs like wildfire, can only be vaguely ascribed to influences inimical to the long existence of the bacillus of typhoid fever.

Troops in Peking suffered severely from enteric during the year. This garrison, the only station in China, had a small force of but 145 men, among whom 11 had typhoid fever and 1 died, giving an admission rate of 78.86 per thousand mean strength and a death rate of 6.90. Under date of December 14, 1903, Lieut. Paul C. Hutton, assistant surgeon, U. S. Army, surgeon at Peking, reported as follows concerning the outbreak of typhoid fever at that post:

Before my arrival, October 20, 7 cases of typhoid fever had developed and were in the post hospital. These 7 cases reported sick on the following dates: September 21, October 1, 3, 13, 15, 16, and 20. Two cases developed October 26, 1 November 10, and 1 November 14. An investigation was begun immediately after arrival to ascertain the cause of the outbreak. It was found that 6 of the first 7 attacked had been drinking water from Chinese surface wells contrary to existing orders while out of the post, or else had been in the habit of eating uncooked vegetables, such as lettuce, radishes, etc., also against orders. When it is understood that the ordinary Chinese wells are sunk in the black, damp earth, which is saturated with organic matter of all kinds, and that these wells are not always protected by curbing, it is easy to understand how freely the germs of typhoid and of other diseases contaminate the water, on account of the Chinese custom of defecating on the ground at the most convenient point. This excrement is collected by the soil merchant and employed to fertilize the ground, and on this account the germs of typhoid are more abundant in China than in the United States. For this reason it is thought that those of the men who were guilty of eating uncooked vegetables contracted the disease therefrom.

After 7 cases had occurred, I believe, though it is difficult to determine definitely, the remaining cases, except 1, contracted the disease through flies, it being impossible to entirely protect the excrement in the closets on account of the lack of a sewerage system. However, every precaution was taken to guard against the propagation of the disease by these insects, lime in large quantities and disinfectants being freely used, and at the same time all possible protection was given to food, but it is a lamentable fact that in the construction of this post that the closets of both men and officers were made to almost adjoin their respective kitchens. In a locality where there is so much disease as in Peking, this proximity of the closets to the kitchens should not be permitted to continue.

In the case of Lieutenant C., who neither ate nor drank anything of a suspicious nature except cream, it is assumed that he contracted the disease from this cream which he was in the habit of using daily, it being known that the milk venders are not careful in the cleansing of their pails and pans, most of them using the surface well water for this purpose.

I heard it frequently asked why, under such alarming conditions, the Chinese do not die of typhoid fever. Inquiries among the physicians here who attend the native population reveal that they suffer very largely and frequently die. That they do have this disease there is no doubt, but that they have it less frequently than Americans or Europeans would have it under similar circumstances there can be no question. By long years of contact and by immunity handed down from father to son

purification plant designed by the Municipal Engineering Company of New York, which this board had under consideration:

As I understand it, the problem that the proposed installation is to solve is a sewage affluent which will not affect injuriously the quality of the water supply of this post at the intake 4,000 feet downstream. The conditions obtaining here seem to confine the means to this end to some form of sewage filtration. If I have correctly read the plans, the engineering company proposes to install: First, a crematory for the destruction of the coarsest parts of the sewage and other wastes; second, a septic tank for bacteriological saturation (putrefaction); third, bacteria base for purification.

This scheme seems to embrace the latest features of these forms of sewage disposal and should, if successful, thoroughly antisepticise the sewage.

I understand from Mr. Smith, the engineer of the company, that all the features of the present plan have never been put into actual use by his company in the proposed combination, though, as we know, each has repeatedly demonstrated its value in sewage disposal. In this sense the undertaking must be regarded as an experiment, the value of which can be determined only by the result. I would therefore respectfully suggest that, if the plans of the Municipal Engineering Company be adopted, this company be required to superintend the construction of the plant and to guarantee its efficiency for a period of years. I have no doubt as to the correctness of the principles upon which the plans are based, but I am not prepared to express an opinion as to their application. The responsibility of this should rest upon the municipal company, not for a month or two, but for several years.

Of course the most radical fault of the whole system is the fact that the outfall of the sewer system is so short a distance above the intake of the water supply.

In accordance with the recommendations of the board, a contract was entered into with this company. At last report the sewage-disposal plant had not been put into operation. An opinion can not be expressed, therefore, as to its efficiency.

A number of plans for obtaining better water have received consideration. Among these were wells in series, which have been very satisfactory at Fort Riley, and which apparently should be equally so here; a post waterworks and purchase from the water company at Fort Leavenworth, Kans. The last has been selected; negotiations are now in progress with a view to determining the price to be paid the company for water, and it is hoped that the important sanitary questions in connection with the water supply are now on the eve of settlement in a satisfactory manner. It is but just, as the affair now stands, that an opportunity be given for a trial of the sewage-disposal system and the new water supply; but if it is found that existing conditions are not remedied and that this post, important not only from the size of its garrison but as the home of several service schools, is still a prey to typhoid fever, they can not be too quickly condemned and other and more effective measures adopted.

Fort Niagara, New York, is another post which has contaminated water that requires sterilization before use for drinking purposes. Capt. Ira A. Shimer, assistant surgeon, U. S. Army, surgeon, under date of May 15, 1904, made the following interesting report on typhoid fever at that station:

On my arrival at Fort Niagara for duty as surgeon (in January, 1902) I made an examination of the sanitary conditions in and surrounding the post, and upon investigation of the water supply I found that the general supply for all purposes was pumped from the Niagara River. Owing to the large population resident along this river, I became suspicious of its potability, but upon examination of the hospital records, and inquiry among resident physicians, I was satisfied that such cases of typhoid fever as had occurred in the post and vicinity had had their sources of infection in other sections.

The chemical analysis of the water as taken from the post supply was made by Dr. W. M. Mew, of the laboratory of the Surgeon-General's Office, on August 3, 1896, with the following results expressed in parts per 100,000: Chlorine, 0.7; nitrites,

none; nitrates, trace; free ammonia, 0.004; albuminoid ammonia, 0.01; total solids, 14; grams on ignition, 4.

Doctor Mew expressed the opinion at that time that the water "may be regarded as representing a river water of good quality."

Cases of typhoid fever were treated in this hospital as follows:

Case 2701, admitted May 27, 1902; origin, Buffalo, N. Y.

Case 2837, admitted December 4, 1902; origin unknown, probably local.

Case 2868, treated in quarters, beginning January 25, 1903.

On the confirmation of the diagnosis in case 2837 recommendation was made to the adjutant, Fort Niagara, New York, that all members of this command be instructed that when absent from this post, and especially when visiting Buffalo, Niagara Falls, or Lewiston, N. Y. (typhoid fever being endemic in those cities), they use the utmost caution that they do not drink either water or milk that had not been previously boiled, and orders were issued to accord with the recommendation. On the appearance of case 2868 I became again suspicious of the integrity of the water as supplied to the post, and on January 28, 1903, a sample was secured by allowing the water to flow freely in the cellar of the steward's quarters for over an hour, when the specimen was taken, sealed, and forwarded to the curator of Army Medical Museum, Washington, D. C., for bacteriological examination. Under date of February 10, 1903, Dr. James Carroll furnished the following report thereon:

"* * * bacillus cloace was obtained. Hanging drop preparations from four of the original fermentation tubes revealed the presence of a streptococcus. Subsequent cultivations upon the various culture media and usual bacteriological tests confirmed the identity of the colon bacilli.

"The presence of the colon bacillus alone in such a large proportion of the tubes is sufficient ground for regarding the water with grave suspicion. Since the colon bacillus, bacillus cloace, and the streptococcus are all acknowledged sewage bacteria it is believed that this water should be condemned as unfit for use and liable to produce disease."

On February 20, 1903, the adjutant, Fort Niagara, N. Y., was furnished with a copy of this report with the recommendations: 1. That Waterhouse-Forbes sterilizers be supplied by the quartermaster's department and that all water used on the reservation for culinary or drinking purposes be required to be sterilized. 2. That as soon as weather conditions permit, artesian or other wells be constructed to supply a safe and suitable water for this station.

On April 20, the delivery of sterilized water was begun, all organizations and families on the reservation being supplied, and the use thereof enjoined upon all persons in accordance with the above recommendation, and following the use of sterilized water was noticed an immediate and total cessation of the cases of minor diarrhea that had been appearing at sick call for treatment, leaving no doubt in my mind that if the Niagara River water was not in itself a source of infection of typhoid fever it was productive of an inflammatory condition of the intestinal tract that formed an ideal lodging place for the bacillus typhosus.

During the month of April, 1903, a bricked well was constructed near the quartermaster's warehouses, and upon work being stopped was covered over.

On July 14, 1903, case 2946 developed, but as the patient had joined his company but three days previously from Fort Slocum, that post was considered the source of infection.

The cases included in the epidemic which is the cause of this report were admitted to this hospital as follows:

Case 3004, L. W. B., private, C, Ninth Infantry, admitted December 26, 1903.

Case 3011, D. S., corporal, K, Eighth Infantry, admitted January 6, 1904.

Case 3012, C. B., private, K, Eighth Infantry, admitted January 6, 1904.

Case 3014, C. H. R., private, K, Eighth Infantry, admitted January 11, 1904.

Case 3015, C. F. B., private, K, Eighth Infantry, admitted January 13, 1904.

Case 3016, T. M., sergeant, K, Eighth Infantry, admitted January 18, 1904.

Case 3017, J. E. H., private, K, Eighth Infantry, admitted January 21, 1904.

Case 3018, C. A. K., private, K, Eighth Infantry, admitted February 5, 1904.

Having learned that private B. C. Ninth Infantry, was in the habit of spending his evenings in the barracks occupied by Company K of the Eighth Infantry, and the fact that he with members of that company alone were infected, led me to make a thorough inspection of those barracks and the conditions existing there. It was found that at this time Company K was numerically about 30 per cent stronger than the other companies stationed at this post—Companies A, C, and D, Ninth Infantry—owing to the recent acquisition of a number of recruits by Company K, and to the absence of details from the several companies of the Ninth Infantry on guard duty at Allegheny Arsenal, at that time a subject of Fort Niagara. At the same amount of water was delivered to each of the four companies, the augmented strength of

Company K caused the supply at those barracks to become exhausted during the evenings, with the result that the men were obliged to resort to the faucets supplying the river water, owing to the noncommissioned officers of that company failing to have the containers refilled. During this time the Niagara River was filled with floating ice, some of it coming from the upper Niagara River, Lake Erie, and their tributaries, and no doubt containing an unusual amount of the sewage of Buffalo and Niagara Falls, which being ground up by its passage over the Niagara Falls and through the Niagara Gorge, melted rapidly in the swift current of the lower river, fairly loading the water with the disease-producing bacteria present in sewage.

At this time the members of Company K were in the habit of drinking a large quantity of sweet cider, a barrel of which was kept on tap in their barracks almost constantly, causing a number of cases of slight diarrhea, and which was no doubt a factor in the predisposition to infection caused by the irritant action of the river water.

Under date of January 11, 1904, recommendation was made to the commanding officer, Fort Niagara, N. Y., that steps be taken to insure a constant and sufficient supply of sterilized water, and that all persons belonging to the command be impressed with the necessity for the use of the sterilized water and no other. This was done, and no case developed beyond the incubation period from that time.

Of the eight cases included in this epidemic, case 3017 alone was of a mild, uncomplicated form, the febrile condition disappearing on the eleventh day after admission. Cases 3015 and 3016 ran a normal course. Cases 3004, 3011, 3012, and 3014 were of a severe, protracted type in which the febrile condition lasted over forty days; while case 3018 was of an extremely severe type complicated with hyperpyrexia, lasting for nine days, meteorism for six days, extravasation of blood from all mucous membranes for eight days, purpura hemorrhagica, intestinal hemorrhage necessitating transfusion, phlebitis of the dorsal veins of the penis, which, notwithstanding incision of the dorsum, involved the loss of the anterior third of the penis, a portion of which was rebuilt by skin grafting covering a period of twenty days. This case also developed a post-typhoid neuritis of the left sciatic nerve with a slight paralysis of the left leg which was improved by galvanism.

On admission all of these cases gave positive results with the Ehrlich diazo-reaction, had a markedly dicrotic pulse, high temperature, and after periods ranging from three to six days developed the characteristic rose spots. The Widal reaction was applied to cases 3004, 3011, and 3012, with positive results. Cases 3011, 3012, and 3014 showed marked bronchial symptoms on admission. There was no mortality during this epidemic.

At the time of rendering this report the system of supplying sterilized water in cans is still in vogue at this post.

During the entire period of almost five months covered by this epidemic the utmost care was exerted that all articles used on or about the patients were thoroughly disinfected either by boiling or submersion for twelve hours in a one-half per cent solution of tricresol; the patients were isolated and all the dejecta disinfected with crude carbolic acid, and the necessity for extreme care and watchfulness was made plain to all persons whose duties brought them in contact with the sick or articles used in their care, with the result that there was no infection from the patients in hospital. At the conclusion of the outbreak the ward occupied by the cases was thoroughly cleansed, the wax coating removed from the floor and a new one applied, the beds, furniture, and woodwork washed with a solution of carbolic acid, and all the bedding disinfected by formaldehyde.

Before concluding this report it is my desire to call attention (of the chief surgeon of this department and of the Surgeon-General) to the conduct of this detachment of the hospital corps during the epidemic. Although undermanned by one of the detachment being sick in hospital they at all times performed each and every duty incident to the proper care of the sick and the administration of the hospital without regard to hours or personal inclinations, and to their devotion to duty can be ascribed a large measure of the results achieved. Some idea of the work performed by them may be obtained from the fact that during the height of the epidemic no less than 534 baths were given, and the additional labor and care rendered necessary by a temperature varying from zero to 14° below.

As drainage into the Niagara River must increase greatly it is improbable that this stream can ever again be depended upon for a safe water supply, and driven wells are now being considered as a source for the post water supply.

Fort Monroe, Va., had 11 cases of typhoid fever during the year. Possible sources of infection of that command, as stated by Maj. R. W.

Johnson, surgeon, U. S. Army, were from the adjoining town of Phoebe, by drinking well water or by eating oysters from Mill Creek, which receives the town sewage, or by drinking water derived from the Newport News city mains in the post, which is the common practice of some of the men, as they dislike the taste of distilled water, which, on account of the dangerous quality of the garrison water supply, is furnished the entire command. Fort Monroe has had a bad water supply for some years and in consequence has suffered severely from typhoid fever. At the time of the Spanish-American war a distilling plant was put in operation for the general hospital which was established there at that time, and since the breaking up of the hospital the post has used the plant for its drinking-water supply, with the result that there has been some lessening in enteric, although, as stated by the surgeon, the usual difficulty of confining men to sterile water when another more palatable is at hand has been experienced.

The subject of a pure-water supply for Fort Monroe has received consideration during the year. The old distilling plant having proved too small for the needs of the garrison, the mechanical system of filtration for all water was recommended by this office, but it was decided to install a larger distilling plant.

At Camp George H. Thomas, Georgia, 15 cases of typhoid fever appeared in the command. A number of the patients undoubtedly became infected while absent from the station. The rifle range for Camp Thomas is at Waco, Ga., and the detail of troops at this range has always been prolific of typhoid cases, partly because of contaminated water there, and partly on account of the bad water obtained while on the march going and returning. Contaminated water is obtained near Camp Thomas by men on pass, and while the drinking water is from an artesian well and is excellent, the surgeon, Maj. Henry C. Fisher, surgeon, U. S. Army, believes some cases were due to the water of Chickamauga Creek, which is used for bathing, dish-washing, etc. The last source of infection will be done away with on the occupation of the new post, probably in the early part of the coming year.

The maneuver camps of the year have been exceptionally free from typhoid fever. At the combined army and navy maneuvers, Portland Harbor, Maine, not a single case appeared, although some of the troops were in camp for over four months. The joint maneuvers at West Point, Ky., were equally fortunate, but a few cases of enteric occurred at similar maneuvers at Fort Riley, Kans.

Return of the Sixth Battery, Field Artillery, which contained nearly all the sufferers, to quarters in the post at Fort Riley, in accordance with the recommendation of the chief surgeon of the Provisional Division, Lieut. Col. John Van R. Hoff, deputy surgeon-general, U. S. Army, and careful disinfection prevented further extension of the disease. The cause of this outbreak was carefully studied by a board of medical officers, consisting of Lieut. Col. E. F. Gardner, deputy surgeon-general, U. S. Army, and Maj. Paul Shillock, surgeon, U. S. Army. Maj. E. B. Frick, surgeon, U. S. Army, who was detailed on the board in the order convening it, was prevented by other duties from attending its sessions, and therefore took no part in the proceedings. The board's report was in part as follows:

The board having secured the histories of and carefully examined the suspected cases, reached the conclusion that there was sufficient probability of the disease being

typhoid fever to make immediate action necessary, and verbal recommendation was therefore made to the division surgeon that the Sixth Battery, Field Artillery, in which most of the cases originated, be removed at once from the camp and returned to its barracks at Fort Riley.

The board then proceeded to a further investigation of the cases in the Sixth Battery, Field Artillery, with a view to ascertaining the probable source of origin of the disease. The patients were questioned as to their drinking water, other than that from the post supply, as to their use of milk and where obtained, as to articles of food or drink which they may have obtained in Junction City or from neighboring ranches, as to water drank on practice marches in the vicinity of the post, and as to whether those attacked were intimate companions and therefore likely to have been subjected to the same causes. No positive definite relation between the disease and any of these possible causes could be discovered, except, perhaps, the drinking of water on practice marches.

Capt. G. W. Gatchell, Artillery Corps, U. S. Army, commanding the battery, was also examined by the board and was unable to furnish any information upon which a legitimate conclusion could be reached, but stated that the men may have drank water from wells, etc., on practice and road marches.

The barracks occupied by the battery were carefully examined, with negative result. The board finds that the men attacked lived in three different squad rooms on different floors of the barracks. In each squad room, however, the beds of the men attacked were not far apart. It would seem that the post water supply or other post conditions can not be at fault, or the disease would not be confined to this battery. The barracks occupied by this battery are located between two others, in all respects similarly constructed, on the east side of the artillery parade.

There were eight suspected cases in this battery which were investigated by the board. The following points are to be noted in connection with these cases:

1. The improbability of the cause existing within the post, as the cases, with one exception, are confined to one organization, which obtains its milk and other supplies from a source common to all.

2. That the disease did not originate in the maneuver camp, as some of the cases occurred before and others only a few days after the camp was formed.

3. That this battery had recently made two practice marches without other organizations, viz: One to Wakefield, Kans., September 17, a distance of 16 miles, where they remained over night and on which occasion water was drunk from wells on the road and from the tank at Wakefield. Another march, returning the same day, was made to Ogden, Kans., about 6 miles, about October 5 or 6, but on this occasion little water was drunk except that taken from the post. The first cases appeared only two or three days after this latter march, and it is extremely improbable that the disease was then contracted.

4. That typhoid fever has been endemic in the Kaw Valley since the June floods.

From the history, symptoms, and course of the disease, and notwithstanding the negative result of the blood and urine examinations, the board is constrained to believe that cases 1 and 2 are typhoid fever, probably contracted by drinking water on the Wakefield march, September 17, giving a period of incubation of about nineteen or twenty days. Case No. 3 is one that has been considered doubtful, but it is probably typhoid, although the urine and blood examinations are negative. Cases Nos. 4, 5, 6, and 7 give positive reactions in both examinations, and their general histories also indicate typhoid. In regard to the source of origin of the disease in these cases, and also of case 3, it may be noted that they first began to feel sick on October 15, 16, 14, 12, and 10, respectively. Cases 4 and 7 were not on the march to Wakefield, and if the others be attributed to drinking water on that march it makes the period of incubation about one month, which is believed to be rather long.

It may be noted that case 2 was on kitchen police the day he was taken sick, October 7; also the proximity of the bunks of the later cases to those of the earlier ones. As has been stated in the histories, these cases (Nos. 1 and 2) remained in quarters two or three days after being taken sick, October 6 and 7. Whether these later cases may have been infected from one or the other of these conditions is a question that can not be positively answered, but it would seem that while this does not appear probable it is not beyond the limit of possibility.

The period of incubation would be from six to nine days if that were the case, except in case 7, in which it would be three or four days. But the date on which the sickness first appeared being taken from the patient, his memory may be at fault, especially as he is sick. A latitude of several days may well be allowed for such failure of memory. Case 8 is also a case about which there has been some doubt, but it is believed to be typhoid. The diazo and Widal reactions are negative. He occupies the squad room with case 3, but was taken sick about the same

time, and was not on the march to Wakefield. In this case, too, the correctness of the information given by the patient as to first symptoms is open to much doubt, and the board is unable to reach any satisfactory conclusion in this case.

Regarding the cases in the Sixth Battery, the board has given the matter due consideration and study. It is very difficult, if not impossible, to reach conclusions in all these cases consistent with the evidence that can be at present adduced, but the foregoing embodies the opinion of the board, based on the conditions now existing and on the obtainable information. Later developments may throw more light on the source of origin of these cases and a different solution of the matter may be found.

Regarding the case in the Twenty-fifth Battery stationed at this post, the patient was admitted October 20. The diazo reaction is negative and the Widal positive. It is probably typhoid. This battery has been at the post only two months and has made no practice march. The board is unable to discover the source of infection of this case. There has been no other case in this battery.

The case originating in the Twenty-fifth Infantry was contracted on the march of that regiment from Niobrara to Norfolk, the point on the railroad where they took the train. The diazo and Widal tests were made for the board by First Lieut. Robert C. Loving, assistant surgeon, U. S. Army, using culture media from three different sources, viz: Fort Riley, Fort Leavenworth, and the Surgeon-General's Office. All of the suspected cases have been isolated in one of the wards at the post hospital. The Sixth Battery quarters are in process of being cleaned and disinfected.

No other steps are deemed necessary at present. There have been no new cases since October 24, 1903.

There being no further business before it the board adjourned at 3.30 o'clock p. m., October 29, 1903.

Subsequent to the adjournment of the board yesterday there have been the following developments: Case 6, Private A. H., Sixth Battery, Field Artillery, has had a severe intestinal hemorrhage. This seems to remove all doubt as to the diagnosis in this case.

The case coming from the Twenty-fifth Infantry died last night at 10.30 p. m. The post-mortem shows the characteristic lesions of typhoid in the intestines. This case has no bearing on the cases occurring in the Sixth Battery, which have been more particularly under investigation, as it was contracted in another locality. It is of importance, however, because the examination of the urine and blood in the case gave negative reactions, the Widal tests having been made three times with cultures from different sources and being negative each time. The failure to obtain positive results in these examinations in cases Nos. 1 and 2, Sixth Battery, may therefore have been due to accidental causes, and such results might have been obtained by further examinations. But it was necessary for the board to complete its proceedings and there was not time for such examinations.

It is noticeable that the outbreaks of typhoid fever described, and practically all the other cases which have occurred in the United States during the year, have been due to contaminated water. There can be but little doubt that this is the usual medium for the dissemination of the disease in armies in time of peace, just as it is in civil life. Quite a different condition of affairs obtains in time of war when water plays a minor part. This phase of the subject will be treated in detail in the full report of the Army Board, "On the Origin and Spread of Typhoid Fever in the United States Military Camps during the Spanish War of 1898," which is now in the hands of the printer. The abstract of the report, published in 1900, attracted much attention among sanitarians throughout the world, and the full report, on which Prof. V. C. Vaughan, the only surviving member of the board, has been engaged during the year, will undoubtedly be a classic on this important subject.

TUBERCULOSIS.

During the calendar year 1903, 263 cases of pulmonary tuberculosis, equivalent to an admission rate of 3.89 per thousand of strength, were reported from the Army, with 189 discharges and 36 deaths, equal to 2.79 and 0.53 per thousand men respectively.

Troops in the Pacific Islands and China showed an admission rate of 4.37 per thousand of strength as compared with 3.84 in Cuba and Porto Rico and 3.62 in the United States.

Four cases of tuberculosis of the larynx, 1 resulting fatally and 2 being discharged for disability, occurred during the year, while the 2 cases of abdominal tuberculosis admitted to sick report both died.

The rates of admission, discharge, and death for men suffering with tuberculosis of other organs were 0.30, 0.10, and 0.03 per thousand, respectively, while 2 admissions, with 1 discharge for disability, occurred from white swelling and the 1 admission for tuberculous abscess was returned to duty.

For all other tuberculosis cases, including pulmonary tuberculosis, there were 300 admissions, or 4.43 per thousand of the strength of the Army, of which 201, or 2.96 per thousand, resulted in discharge for disability, and 45, or 0.66 per thousand, terminated fatally. During the previous year 354 cases of this disease were admitted, or a rate of 4.38 per thousand of strength. There were 196 discharges and 69 deaths, equivalent to rates of 2.43 and 0.85, respectively.

Of these cases 178, or 4.20 per thousand, occurred in the United States, with 173, or 4.10, discharged for disability, and 36, or 0.86 deaths per thousand of mean strength. In Cuba and Porto Rico there were 6 cases, equivalent to 3.84 per thousand men, with 1 discharge for disability and no death. One hundred and sixteen admissions, equal to 4.86 per thousand of strength, were recorded in the Pacific Islands and China, of which 9 terminated fatally and 27 were discharged for resulting disability.

At the Tuberculosis Exposition, held at Baltimore, Md., in January, 1904, the Medical Department of the Army was represented by Maj. George E. Bushnell, surgeon, U. S. Army. The following extracts taken from his report are of interest:

The exposition was held under the auspices of the tuberculosis commission of Maryland conjointly with the State board of health of Maryland and the Maryland Public Health Association. In the words of its founders, it was intended as "an objective presentation to the people of Maryland of the history, distribution, varieties, cost, prevention, and cure of tuberculosis." The exhibits were displayed in the corridors adjoining the McCoy Hall of Johns Hopkins University. A large number of charts presented the statistics of the subject in a graphic way, showing the relation of tuberculosis to other diseases as a cause of mortality, its incidence as affected by race, age, sex, occupation, heredity, marriage, food and drink, dwellings, wages, etc., and the economic loss to the community by its prevalence. Many photographs of the slums of the great cities showed the unhealthful and crowded tenements in which tuberculosis develops with especial frequency and also the amelioration of the sanitary conditions effected through the advice and assistance of visiting nurses, the nature and scope of whose work were further shown by statistical reports and by the histories and photographs of individual cases.

Sanatoria, public and private, for the treatment of tuberculosis in the United States and abroad were shown in photographs, plans, and even in some cases by models, one of the most interesting of the latter being a model of the camp at Manhattan State Hospital for the treatment of the tuberculous insane, which was made by some of the patients. Models of tents and "shacks" used in the outdoor treatment of the disease were an interesting feature, among which the Gardner tent is especially deserving of notice. A full size Fisher tent was one of the exhibits. This tent, which is a modification of and improvement upon the Gardner tent as respects the mode of ventilation, appeared to me a most valuable contribution toward the desired end of securing perfect ventilation in cold weather with the avoidance of draughts and undue exposure.

The pathology and bacteriology of tuberculosis were illustrated by a special exhibit (for the benefit of the profession only) of specimens of tuberculous organs in man and animals, of wax models of tuberculous skin lesions, and of pure cultures of the tubercle bacillus of man and animals.

In connection with the exposition proper a series of interesting lectures upon different phases of tuberculosis was given in the adjoining auditorium.

The address of Mr. Hoffman, who is the actuary of a large insurance company, discussed the mortality statistics of tuberculosis as influenced by race, age, conjugal condition, occupation, religion, heredity, etc.

Doctor Flick's address on house infection in tuberculosis emphasized the danger of confined spaces, the speaker going so far as to say that an inclosure of some kind is so necessary for the conveyance of the disease that infection is impracticable without it.

The papers by Doctor Ravenel and Doctor Salmon were of more technical nature than those that preceded them. Doctor Ravenel devoted himself mainly to combating the views of Koch as to the noncommunicability to man of bovine tuberculosis, holding that the repeated finding of the bovine tubercle bacillus in the intestinal tract of children was proof that this bacillus is a factor in the spread of the disease in the human race. Doctor Salmon's paper maintained the essential unity of the tubercle bacillus of man, cattle, fish, and birds.

The nature of the address of Doctor Knopf is sufficiently indicated by its title. It was an admirable popular presentation of the facts of tuberculosis which must be generally understood before its eradication can be hoped for.

The address of Doctor Adami consisted mainly in a critical discussion of the views of Behring that human tuberculosis is chiefly caused by the ingestion of the tubercle bacillus, and that the bovine tubercle bacillus is more infectious to man than the human. Doctor Adami supported the more commonly held view that the bacillus gains access to the human body chiefly through the lungs by the inhalation of dried sputum.

The lantern demonstration on Saturday afternoon by Doctor Potter of a large number of microphotographs showing the histology of tubercle was preceded by a popular address by Doctor Welch on the pathology of tuberculosis and the hygienic means of prevention and cure of the disease.

In the lantern demonstration on Saturday evening Doctor Huber showed by charts and photographs the distribution of tuberculosis in New York City, the local conditions favoring its spread, its racial incidence, etc. He also exhibited many views of sanatoria for the treatment of tuberculosis in all parts of the world.

This demonstration completed the programme of the exposition as originally planned, but on account of the great and unexpected interest manifested it was decided to continue the exposition for two days longer, and an address was given on Monday night, February 1, by Doctor Osler, on the "History of Tuberculosis," or, to be more exact, on the history of the development of medical knowledge of the disease and of its treatment.

The success of the exposition in accomplishing its chief purpose—that is, the awakening of the people of Maryland to a sense of their duty with reference to the prevention of tuberculosis and the care of the tuberculous—must be left to the future to determine. The plans of its founders were certainly wisely conceived and skillfully carried out, and the popular interest was all that could be desired. In fact, the size of the audiences, even in the most unpleasant weather, was constant source of surprise and gratification to the officers of the exposition.

While there was necessarily much in the lectures and the exhibits which was not new to the medical visitor, it was of great advantage to him to be enabled to study the methods adopted in this the first exposition of the kind ever attempted in the country and to meet the physicians present from Baltimore and from all parts of the United States and Canada, among whom were some of the most noted specialists in tuberculosis.

There was a gratifying unanimity among the speakers upon the practical topics as to the treatment of tuberculosis. Rest, relative or absolute, as the activity of the disease may require, an abundance of nourishing food, and outdoor life were the three essentials insisted upon in the treatment.

The great value of rest appears to be so little understood by the medical profession at large that no opportunity should be neglected of emphasizing its importance. It could be wished that the many physicians who send advanced cases of tuberculosis to the Rocky Mountains plateau with injunctions to "rough it" might have had the benefit of these addresses.

LEPROSY.

The case of leprosy has continued under treatment since last report. The results obtained are decidedly favorable, and a permanent cure is

at least a possibility. Lieut. H. L. Gilchrist, assistant surgeon, U. S. Army, who has had charge of the case, under date of December 21, 1903, reports as follows:

At a recent examination of the patient the following condition was found: Physical condition excellent, heart and lungs normal, liver and spleen slightly enlarged, urine and feces negative; blood examination shows increased number of leucocytes. The nodules and swellings on the body have either become greatly reduced in size, or disappeared entirely, leaving discolored outlines of a yellowish or darkish brown color. With the disappearance of the nodules the anesthetic areas have also disappeared, so that at present areas of this kind are not to be found. The lepra bacillus, the supposed organism of leprosy, still remains, the Roentgen rays having no apparent effect on it as regards to numbers, but this organism differs from all others in relation to Koch's law, which is to the effect that in order to absolutely confirm the specific signification of any sort of bacteria it will be necessary to prove: First, that the bacteria or organism is really present; second, to be able to cultivate it outside of the organism; and, third, to again originate the same disease by means of transmission of cultures.

It will be seen according to this law there is no direct proof that the organism found is the cause of leprosy, and as the second and third parts can not be carried out, it is impossible to state whether the organism found is an active or dead one.

In trying to cultivate it all kinds of schemes and methods have been resorted to. Besides the regular laboratory media, others were prepared from fish, oysters, crabs, snakes, different kinds of plants, vegetables, etc.; these were inoculated from different sections of the body and under different degrees of heat and moisture. In some cases small sections of tissues were introduced directly into the media, but all to no avail. By experiments recently made here it has been demonstrated that if tissues containing the organism were subjected to moist and dry heat and to the different germ-destroying liquids the bacilli would undergo no change whatsoever in regard to its staining qualities, showing up just the same as organisms taken directly from the nodules. So it will be seen that there is no possible way of determining whether the bacilli are dead or alive. An experiment is now being tried on the patient which, if successful, may throw some light on the subject. In the experiment a part of the body free from bacilli is being used as a medium to grow the organism taken from another section. A small piece of membrane from the nasal cavity containing many bacilli has been introduced beneath the skin on the chest, which is apparently free from disease. Should this show any signs of growth another piece will be put through the boiling and sterilization process and this, too, transplanted; and, thirdly, a scraping from the base of the nodule that has not been exposed much will be tried in like manner and all results noted.

Application has been made to the superintendent of the Louisiana leper colony for tissue from some of the cases there, which will be used in making a comparative study of the organism with those found in our patient.

Up to the present time the patient has had about four months of X-ray treatment, including exposures to various kinds of lights, etc.; although actual treatment was commenced about May 20 last, there have been several intervals during which no treatment was administered whatsoever. The latter part of September all treatment was discontinued for a period of two months. This cessation of treatment was decided upon not only to give the patient a much-needed rest and opportunity for the heavily tanned skin to bleach out, but also to determine the effect of cessation of treatment. This rest proved very beneficial to the patient, and the desired bleaching effect of the skin not only took place, but some of the swellings, presumably from slight X-ray burns, subsided, and no signs of new nodules appeared. In fact, since commencing the X-ray treatment no new lesion of any kind has been discovered. Although the bacilli have not disappeared we know not whether they are dead and harmless or alive and still active. One thing has been demonstrated, that two of the three important constituents of the lepra nodule have disappeared—the swelling and the anesthesia.

In applying the rays in this case different parts of the body have been treated by different methods, and various schemes have been resorted to in a vain attempt to rid the system of these organisms. The rays have been thrown through different colored liquids and antiseptic solutions and medicated ointments covering the skin; also tubes of different degrees of hardness have been tried, but notwithstanding all efforts the organism still remains.

The patient is living in the building intended for the mortuary just in rear of the hospital. A five-room house has been erected for him in an isolated section of the reservation, but as all of the excitement and fear of his presence has subsided and his

present quarters are far enough away to be absolutely safe, it was not deemed advisable to move him while under treatment. He is in such good condition now that no restrictions are placed upon him as to his movements about the island, but before he leaves his quarters he is compelled to wash his hands, face, and hair, with a solution of bichloride 1-2000, and in his travels he is not allowed to enter any buildings or outhouses, and no one is permitted to approach him nearer than 8 feet; in fact, all precautions are being observed to prevent any undue criticisms or comment. A private of the hospital corps has until recently always accompanied him while off the reservation, but such is not deemed necessary now. He spends most of his time out of doors, weather permitting. The enlisted men are very friendly to him, and are allowed to talk to him at all times, the only restrictions being that they shall not approach him closer than 8 feet and not enter his quarters.

As before stated the man is in excellent physical condition and claims he never felt better in his life. He has his daily routine of work and exercises; goes through the morning calisthenic drill with his company, runs on the beach, and takes long walks at will. At present he is receiving very few X-ray exposures, and no medicine of any kind.

As the X-ray treatment is purely experimental it is going to take some time to tell what the final results will be. In quoting Blaschko: "If anything can be done whereby an improvement is noticed in treating leprosy, there is hope." With the great improvement already noticed, I can only repeat a statement in a former report: "The results thus far obtained look decidedly favorable, and a permanent cure is at least a possibility." It is hoped that before long arrangements will be made whereby the patient can be assigned to outside work of some kind which will not only give the Government the benefit of his services, but will also give him something to think about besides his trouble.

Under date of April 24, 1904, Lieutenant Gilchrist submitted the following additional report on the case of leprosy:

As stated in former reports, the patient's improvement in general health and appearance and as a result of one year's treatment with the X-ray is apparent to all who have seen him, but it is to be regretted that it can not be said that he has made a complete recovery, as the lepra bacilli are still present in great numbers.

It may be said, however, that we are still in the dark regarding the nature of these organisms that have not complied with Koch's law for the determination of pathogenic bacteria in any particular and some are inclined to consider them an effect rather than a cause of the disease. Be that as it may, it is certain that up to the present the X-rays have had no apparent effect upon the organism whatsoever.

Mention was made in a previous report of experiments made by inserting under the skin pieces of bacilli-laden tissue from the nasal cavity, which had been subjected to numerous exposures to the X-rays, and of leprous tissue sent me by the superintendent of the Louisiana leper colony.

In November the tissues were introduced under the skin on the left breast just beneath the nipple. This section of the body was decided upon because it was apparently free from all signs of the disease and microscopical examinations had failed to reveal the presence of the organism or any other signs of leprosy. Strict antiseptic precautions were observed throughout the experiment, the breast having been washed and prepared with as much care as for any surgical operation. A small lineal incision was made about one-half inch long and one-fourth inch deep, and into this the tissue from the nose was introduced. The wound was sutured with silk-worm gut and sealed with collodion. About 2 inches below and to the left of this another incision was made of similar dimensions and into this a piece of the tissue obtained from the Louisiana colony was introduced and the wound closed with the same precautions. The object of the experiment was to determine whether the human body could be utilized as a medium for the growth of this organism which had refused to grow in all laboratory media.

In the case of the tissue which had been taken from the nasal cavity and previously subject to numerous X-ray exposures, a small area of inflammation soon started around the wound, this was followed five days later by a small ulcer involving the lower half of the incision and from which a slight discharge of yellowish pus was thrown out containing lepra bacilli. The wound acted very much like one caused by the introduction of any foreign substance into a wound. After a few days the discharge lessened, the lepra bacilli became less abundant and numerous examinations of the resulting bright red scar have failed to reveal the presence of the organism.

In the case of the tissue from the Louisiana Leper Colony the wound healed by first intention without signs of inflammation and examinations of snippings from the

resulting scar made from time to time have revealed the presence of the bacilli, but up to the present time there has been no sign of anesthesia or swelling.

The experiment has served the purpose of demonstrating that there is a difference in the action of the two tissues, the tissue which had been exposed to the rays sloughed out and disappeared, while that which had never been exposed to the rays remained and seemed to retain its morphological condition, but showed neither evidence of increase in size, nodula formation, nor area of anesthesia.

Mangrove treatment.—Through the courtesy of Doctors Dugue and Moreno, two prominent Cuban lepra specialists, a large consignment of the different preparations of Mangrove bark was sent here to be used for the patient. It was decided to give this treatment a trial to see if it would influence in any way the organisms which were not being affected by the X-rays. All of the different preparations of the drug sent here for the purpose were tried, all directions being followed explicitly, and as the remedy was supposed to cause the bacilli to disappear from the body, experiments were carried out to determine what effect the drug has on the bacilli outside of the body.

Pieces of tissue which had been exposed to the rays, and that obtained from the Louisiana Leper Colony, were submerged into different solutions of the Mangrove bark of varying strength, also pieces were buried in the powder and left for several weeks, then taken out and examined microscopically when it was found that the organisms remained unchanged in all cases, the drug having no apparent effect upon the bacilli outside of the body.

The treatment was commenced on December 24 and continued faithfully until all of the different preparations were used up, great care being exercised at all times in following directions. As a result of this treatment the patient experienced continuous trouble with his stomach and bowels which was not only disagreeable to himself but to those around him, and he seemed greatly relieved when he learned that the last of it had been taken. Excepting an attack of indigestion and nausea lasting several weeks there was no change whatsoever in his condition.

Physical examination.—On April 24, 1904, the patient was again examined thoroughly and the following noted: Heart and lungs normal, liver normal, spleen slightly enlarged, urine showed traces of sugar, feces negative, no large nodules anywhere, and no signs of anesthesia. On March 15, signs of X-ray burns were discovered on patient's elbows and later developed into superficial burns, covering areas over both elbows the size of the palm of the hand. Immediately following these burns, small swellings were discovered between some of the deeper extensor muscles of the forearm and one or two along the course of the ulna nerve. As these were deep seated and seemed to gradually disappear it was not deemed advisable to cut down on them for diagnostic purposes.

The patient having been subjected to almost daily X-ray exposures from tubes of different degrees of hardness, he presents a heavy coating of tan all over the exposed surfaces. Throughout the past year he has enjoyed excellent health, as he claims, the best in his recollection.

Blood examination.—Throughout the entire year the blood was examined from time to time and always showed an increased number of leucocytes varying from 15,000 to 40,000 per cubic millimeter with an unusual large number of eosinophiles. The man continues with his daily routine of work and exercise, including morning calisthenics, long walks, and boating. As he has been under constant treatment for nearly a year, it is recommended that all X-ray treatment be discontinued and the result of the year's treatment noted. In no case thus far has there been any sign of recurrence of any of the old nodules.

In the beginning it was intended to work on different parts of the body with the different kinds of apparatus for the purpose of comparing the results obtained from each, but in the treatment it soon became apparent that the scheme was not feasible on one patient, so that results obtained from the coil or the static machine can not be noted, but as far as the workings of the different apparatus are concerned, there is no comparison between a static machine and a coil for general work, the coil being by far the more satisfactory of the two.

I wish to take this opportunity of thanking Dr. George R. White, of Savannah, Ga., an ex-surgeon in the United States Army during the war with Spain, for the kind assistance and encouragement he has tendered at all times, and Dr. Isidore Dyer, superintendent of the Louisiana Leper Colony, for specimens of leper tissue which he has furnished me for purposes of comparison.

In the carrying out this important work too much credit can not be given to the noncommissioned officers and privates of the hospital corps detachment at this post, for the great assistance they have rendered, and the zeal and courage they have displayed at all times in connection with the work.

BERI-BERI.

There were 636 cases of beri-beri, giving an admission rate of 9.42 per thousand for the whole Army in 1903, of which 9 were discharged for disability and 25 died, equivalent to 0.13 and 0.37 per thousand of strength, respectively. These figures exceed slightly those of the previous year, with the exception of the death rate, which is a little lower than for 1902.

One admission and 4 discharges are recorded as occurring in the United States, while the remaining cases and all deaths are reported from the Pacific Islands and China, where the admission, discharge, and death rates per thousand of strength were 26.66, 0.21, and 1.05, respectively.

White troops gave 22 admissions, or 0.37 per thousand men, resulting in 4 discharges for disability and 3 deaths, equivalent to 0.07 and 0.05 per thousand of strength, while Filipinos were admitted to the extent of 128.21 per thousand, of which 1.04 were discharged for disability, and 4.59 per thousand terminated fatally. No case of this disease was reported among the negro troops of the Army.

BUBONIC PLAGUE.

No case of this disease was reported as occurring in the Army during the calendar year 1903.

INTESTINAL DISEASES.

A further reduction in intestinal affections among the troops is noted for the last calendar year. The rate of admission for the whole Army of 168.36 per thousand of strength compares most favorably with that of 1902, when the high rate of 290.61 per thousand was reported. The death rate, too, is less than half of that of the preceding year, while the rate for discharge for disability remains about the same as that for the previous twelve months. The rates of discharge and death per thousand men were 1.75 and 1.07, respectively.

While the rate of admission reported from the Pacific Islands and China of 330.11 per thousand men is still high, it shows an improvement over 1902, when the corresponding rate was 495.02 per thousand. The death rate recorded is less than half of that of the previous calendar year, being but 2.21 per thousand of troops on foreign service.

For the United States an admission rate of 79.81 per thousand is recorded, with rates for discharge for disability and death of 2.77 and 0.44, respectively, while in Cuba and Porto Rico there were 154 admissions, 1 discharge for disability, and no death reported for the year.

The following tables show in detail the effect of intestinal diseases on the troops during the calendar year 1903:

WHOLE ARMY

	Cases		Discharges		Deaths	
	Number	Rate	Number	Rate	Number	Rate
Dysentery, bacillary	1,770	28.20	20	0.32	20	3.32
Dysentery, amoebic	441	7.13	4	0.06	2	0.32
Diarrhea, bacillary	1,260	20.23	1	0.01	1	0.16
Diarrhea, amoebic	108	1.74	4	0.06	3	0.48
Appendicitis and abscesses of cecum, ileum, and appendix	230	3.71	5	0.08	4	0.64
Intestinal catarrh	27	0.43	—	—	—	—
Enteritis	40	0.64	23	0.37	1	0.16
Total	3,866	62.38	53	0.86	28	0.45

PACIFIC ISLANDS AND CHINA.

	Cases.		Discharges.		Deaths.	
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
Dysentery, acute.....	1,544	64.83	.....	.....	26	1.09
Dysentery, chronic.....	594	24.94	.....	.....	17	.71
Diarrhea, acute.....	5,018	210.69	.....	.....	1	.04
Diarrhea, chronic.....	109	4.58	.....	.....	2	.06
Appendicitis and abscesses of iliac fossæ.....	63	2.65	.....	.....	2	.06
Intestinal parasites.....	75	3.15	.....	.....	.....	.....
Enteritis.....	459	19.27	.....	.....	5	.21
Total.....	7,862	330.11	.....	.....	53	2.21

UNITED STATES.

Dysentery, acute.....	155	3.67	.....	.....	3	0.07
Dysentery, chronic.....	243	5.75	85	2.01	4	.09
Diarrhea, acute.....	2,423	57.33	.....	.....	.....	.....
Diarrhea, chronic.....	82	1.94	6	.14	.....	.....
Appendicitis and abscesses of iliac fossæ.....	142	3.36	5	.12	6	.14
Intestinal parasites.....	60	1.42	.....	.....	.....	.....
Enteritis.....	268	6.34	21	.50	6	.14
Total.....	3,373	79.81	117	2.77	19	.44

CUBA AND PORTO RICO.

Dysentery, acute.....	11	7.05	.....	.....	.....	.....
Dysentery, chronic.....	4	2.56	.....	.....	.....	.....
Diarrhea, acute.....	119	76.24	.....	.....	.....	.....
Diarrhea, chronic.....	2	1.28	.....	.....	.....	.....
Appendicitis and abscesses of iliac fossæ.....	3	1.92	.....	.....	.....	.....
Intestinal parasites.....	2	1.28	.....	.....	.....	.....
Enteritis.....	13	8.33	1	0.64	.....	.....
Total.....	154	98.66	1	.64	.....	.....

The encouraging results obtained at the United States Army General Hospital, Presidio of San Francisco, Cal., last year in the treatment of chronic dysentery, sprue, and enterocolitis with pure olive oil did not prevail in the treatment of a small number of cases of amebic dysentery in the Philippine Islands during 1903. It appears that the oil caused more or less gastric disarrangement and its administration had to be discontinued within a few days.

Lieut. C. C. Collins, assistant surgeon, U. S. Army, reports as follows on four cases treated with oil at the First Reserve Hospital, Manila, P. I.:

No. 1. Began oil in 20 c. c. doses three times a day in a glass of hot Australian milk on September 22 and gradually increased oil to 40 c. c. Weight at beginning of treatment 100 pounds. Number of bowel movements in twenty-four hours 6. Sick for two months with amebic dysentery. No other treatment was given in this case except high irrigations of the lower bowel with 3.00% solution of quinine sulph. The patient complained that he was nauseated after each dose of oil, but did not vomit. Oil discontinued October 10; weight at this time being 98½ pounds. Number bowel movements 4 in twenty-four hours. General condition not improved.

No. 2. Condition at beginning of treatment: Weight, 108½ pounds; bowel movements, 15 in twenty-four hours. Oil begun September 22, 20 c. c., increased later to 60 c. c. t. i. d. Diagnosis: Chronic amebic dysentery, nine weeks' duration. Treatment discontinued September 10, when patient was transferred to the U. S. Army transport *Thomas*. Condition at this time as follows: Weight, 105 pounds; number of bowel movements, 7 in twenty-four hours. General condition somewhat improved; very little nausea in this case.

No. 3. Condition at beginning of treatment: Weight, 111 pounds; number of bowel movements in twenty-four hours, 6. Diagnosis: Enteritis, chronic, digestion poor. Oil given as in above cases. Frequent nausea and occasional vomiting after taking oil. Condition on discontinuing treatment October 10, when he was transferred to

the U. S. Army transport *Thomas*: Weight, 114 pounds; bowel movements, 4 in twenty-four hours. Notwithstanding the nausea and vomiting this case seems to have shown more improvement than any other under my observation. He received no other treatment.

No. 4. Weight, 129½ pounds; number of bowel movements in twenty-four hours, 3. Diagnosis: Chronic amebic dysentery of six months' duration. Oil given as above. Commenced treatment September 22, discontinued it October 10. This case showed no improvement either in weight or number of bowel movements.

The oil treatment has only proved of marked benefit in one of the above cases. In the cases of amebic dysentery no improvement was noticed different from that noticed in other patients who did not get the oil. I think the above results justify a further trial in cases of frequent bowel movements where the ameba is not found and where the stomach is in condition to retain it.

The following is an interesting report on the treatment of patients suffering from dysentery in the United State Army General Hospital, Washington Barracks, D. C., by Capt. J. H. Ford, assistant surgeon, U. S. Army:

Having noted in the report of Dr. Richard P. Strong, formerly in charge of the army medical laboratory in Manila, that the bacillus and ameba dysenteriae had occasionally been found associated in acute cases of dysentery, I suspected that the chronicity of some of my cases might be due to a mixed infection. For this reason I requested Doctor Taylor-Jones (at that time by your permission studying this bacillus in the laboratory of the Army Medical Museum) to examine the blood of those patients in order to determine whether she could obtain therewith the Pfeifer reaction with the bacillus dysenteriae. All specimens of blood examined agglutinated (with different degrees of intensity) the acid type of this organism, but not the alkaline until after the patient had been treated with antidyenteric serum, when this reaction was obtained with the alkaline type in the only case examined for it.

Five control cases examined for both types were negative. Though the occurrence of the reaction did not of itself prove that those patients harbored the bacillus when they came under observation, no other means of determining their present infection was available and the fact was deemed worthy of consideration in treatment. It may be mentioned that in the chronic cases the B. dysenteriae is very rarely found in the stools except in acute exacerbations, and very rarely then, though they may be found post-mortem in such cases embedded in the tissues of the colon. Doctor Taylor-Jones isolated the bacillus from the stools of one of my patients when he was suffering from an acute exacerbation. This patient, Lieutenant J., had been ill for two years and four months and had been operated upon one year before he came under my care for abscess of the left lobe of the liver.

Until quite recently, I have tried with mediocre results, hydrozone, silver nitrate, and other drugs usually employed in the treatment of this disease. Quinine in solutions of the strength usually employed gave poor results, but the following formula I have found efficacious and still use it in chronic cases when the drugs here recommended are not available:

R. Quinine sulph	15
Ac. tannic	30
Aq. steril.	1,500
Sig: Use as enema daily.	

Far better than quinine for this purpose, however, is eucalyptol or Ol. eucalypti in solutions of from 0.05 to 0.20 per cent strength. Of these the former is much preferable, since its composition is less complex than is that of the latter, and it passes into suspension much more readily. Glycerin in small amounts (10 to 30 c. c. per 1,000 c. c. of water) may be employed to facilitate diffusion, but is not necessary. Both of these preparations, because of their stimulating properties and toxic power upon protozoa, were of great value in amebic dysentery, but only in chronic cases. Upon the appearance of an acute or subacute exacerbation, from whatever cause, their use was stopped at once and eucalyptus gum, in solutions of from 0.10 to 0.40 per cent strength, was employed in enemata in their stead. This last-mentioned drug has both astringent and amebicidal properties, and proved of such value in the treatment of those exacerbations occurring in the course of chronic amebic dysentery that its employment is strongly suggested in cases of this variety which are frankly acute. It is also found of value in chronic cases which are especially liable to exacerbations, but in which none were actually occurring. I have given both eucalyptus gum and eucalyptol in the same solution in selected cases of this type with gratifying results.

As an excipient for the eucalyptus gum in the more acute cases sterile water was generally used, but much better results were secured from the use of milk, or a mixture of milk and olive oil.

Much of the efficiency of olive oil in the treatment of dysentery is, I believe, due to its local action upon the inflamed surface in the bowel. All patients in my series were given the oil (the purity of which had been authenticated by Doctor Hodge, the official analyst for the Medical Department), but only two were benefited by its use per os. The others were unable to take more than gm. VIII three times daily because of the gastric uneasiness its use occasioned. The two who were benefited took about twice that amount without much discomfort. Since the oil appeared in small quantities in stools of these two patients, but did not appear in the stools of those who took the smaller amounts, I was led to believe that the oil absorbed had but little beneficial influence, while that eliminated tended to heal the surface with which it came in contact. The best results from its use by enema were secured in the case of Major A. The local use of oil is followed by better results in the bacillary type of the disease than in the amebic type, and in the acute rather than in the chronic stages of the disease. Its function is essentially sedative.

With olive oil, modifying its soothing influence but not destroying it, I have given with most gratifying results *Ol. gaultheriæ* in solutions of 0.05 to 0.20 per cent strength. This found its greatest usefulness in chronic dysentery of bacillary origin. With the appearance of an exacerbation its use had to be discontinued, but was renewed with advantage when the symptoms ameliorated.

Because of the scarcity of pure olive oil I have used it in quantities of from 60 c. c. to 125 c. c. suspended in 1,000 c. c. of warm fresh milk, with which it had been recently agitated. It may be mentioned that fresh milk is a homely remedy which has proven efficacious in relieving inflammatory conditions of the lower bowel when pure olive oil was not obtainable.

About one-half hour before the administration of a medicated enema the patients have as a rule been given a cleansing enema of sodium bicarbonate in from 2 to 4 per cent strength. A solution of this salt gives much better results than does a solution of calcium chloride, since it is less irritating and removes mucus more readily. If for any reason a separate cleansing enema is not desired, the sodium bicarbonate may be given in the same solution with the eucalyptus or other remedial agents of this type. I have generally given only one medicated enema daily, and have sought to eliminate the ameba by use of eucalyptol and eucalyptus gum before I employed *Ol. gaultheriæ* in bactericidal enemata. I have never given eucalyptol and *Ol. gaultheriæ* in the same solution, but it is probable that this could be done with advantage in chronic cases of mixed infection.

Of the other agents which have been employed per rectum I may state that the mineral astringents, of which silver nitrate is the best, gave less satisfactory results than did the vegetable ones. It was supposed that protargol, because of its power of penetrating the tissues, would prove of value, but its use in solutions of even 0.25 per cent strength caused arrhythmia cordis, so that its usage had to be discontinued. I have had no experience in this connection with the other soluble silver salts, argyrol, collargol, etc.

An antidyenteric serum prepared by an American firm was used with fair success. It certainly was not as useful as that which I have seen used by Strong in Manila or that which Doctor Hodge tells me is prepared in Kitasato's laboratory in Japan. The firm furnishing the supply which I used frankly refused to vouch for its efficiency. This serum was said to have been developed from both the alkaline and acid types of the *B. dysenteriae*. Injections of 10 c. c. were given at intervals for several weeks with rather indifferent results. In only one case was much improvement manifest. This patient gained 13 pounds in twenty-eight days, having received during that period 50 c. c. of serum. A supply of the serum manufactured in Kitasato's laboratory has recently been requisitioned, and it is hoped that this will give more satisfactory results.

The only remedy given by mouth was cupric arsenite. This drug, because of its tonic, antiperiodic, and slight astringent properties, is peculiarly valuable in this disease. In the series here discussed there was no case in which malaria played an obvious part, but the fact that a latent infection with the malarial organism may cause protracted illness clinically identical with dysentery has proved that the exhibition of the drug is useful routine practice. No salts of bismuth were used, since it is believed they hinder the elimination of the amebæ and bacillæ dysenteriae.

Of the seven patients whose cases are here discussed five have returned to duty or are about to do so. The remaining two cases are improving steadily. In view of the fact that the line of treatment above described has been followed less than two months, that one of the uncured patients has been ill with dysentery for five years

and the other for two years and four months, and that in the other—i. e., the cured cases—the illness averaged two years and one month duration, it is believed that the eventual recovery of those who remain under treatment may yet be expected.

In January, 1904, the surgeon at Fort Porter, N. Y., reported the presence of intestinal parasites in men of the command, nearly all of whom were admitted for other conditions. No symptom was noted in these cases other than slight irregularity in the bowels, to which no attention had been given. The ankylostoma appeared to be present in small numbers in most cases, but in one instance more than fifty worms were obtained after a single administration of thymol. The trichocephalus was very constant, but apparently there were only a few worms in each host. The ascarides were found in numbers of from one to eight or ten. The *Tænia nana* was of most interest and was found in old chronic cases of bowel trouble associated with anemia. From one case about fifty were obtained after a single dose of male fern, and from the other over a hundred. Owing to the difficulty in detecting them in the stools there is no doubt but that they were present by hundreds. Whether or not their removal will cure these old chronic cases remains to be seen.

All the diagnoses were made by the microscopical examinations of the feces, and owing to the number of cases detected the examination of the stools of all patients admitted to hospital has been made a matter of routine. The diagnosis has been confirmed by finding the worms themselves in each instance except the trichocephali, which have not been found, but the ova are so easy of absolute identification that there can be no doubt whatever of the presence of the worms.

VENEREAL DISEASES.

The number of admissions to sick report for venereal diseases in 1903 remains large. Although the admission rate for the whole Army was slightly lower than that of the preceding year, the ratio of discharge per thousand of strength was a little in excess of that of last year, while a total of 4 deaths was reported for the Army.

The ratios of admission, discharge, and death in the Army per thousand of mean strength during the calendar year 1903 were 151.48, 4.64, and 0.05 respectively, compared with 160.94, 3.83, and 0.01, the corresponding rates for the previous year.

The following is a tabulated statement of venereal diseases in the Army occurring in the different countries in the past year:

WHOLE ARMY, PER THOUSAND OF STRENGTH.

	Admissions.	Discharges.	Deaths.
Syphilis	23.42	3.23	0.05
Gonorrhea and complications	96.14	1.41	.....
Chancroids	31.92	.....	.....
Total	151.48	4.64	.05

ARMY IN THE UNITED STATES.

	Admissions.	Discharges.	Deaths.
Syphilis	23.64	4.89	0.07
Gonorrhea and complications	84.09	2.15	.....
Chancroids	28.11	.....	.....
Total	135.84	7.04	.07

ARMY IN PACIFIC ISLANDS AND CHINA.

	Admissions.	Discharges.	Deaths.
Syphilis	22.12	0.05	0.04
Gonorrhea and complications	115.66	.05	.....
Chancroids	37.20	.....	.....
Total	175.00	.16	.04

ARMY IN CUBA AND PORTO RICO.

Syphilis	37.80	6.40	.....
Gonorrhea and complications	124.28	1.28	.....
Chancroids	54.45	.....	.....
Total	216.53	7.68	.....

Under date of March 3, 1904, Maj. Charles F. Mason, surgeon, U. S. Army, reports his experience in the treatment of syphilis by hypodermic injections of mercury as follows:

Most of the infections here being of a mixed character (chancroid and syphilis), we do not commence treatment until secondaries appear—a rash, mucous patches, periostitis, etc. Then the injections are begun at once, being given twice a week until all symptoms have disappeared, and then once a week until 12 to 15 injections have been given. After this the patient, whose name meantime has been placed on the syphilitic register, is kept under observation, but is given no further injections, unless symptoms reappear, when he is given a second course of six injections at intervals of a week. Very seldom has a second course been necessary.

The preparation used is a gray oil made of metallic mercury, carefully rubbed up with lanolin, with or without liquid vaseline. I have tried both formulæ and am inclined to prefer that with liquid vaseline (formula of Lang).

R. Lanolin dehydrat 15.000
Chloroformi 50.000

Evaporate in a large mortar with continual stirring down to 30.000. Then add Hydrarg. bidistillat., 30.000. Stir slowly until the chloroform is wholly evaporated and the mercury can no longer be distinguished.

Sig. Ung. cinereum lanolinat. fort.

R. Ung. ciner. lanolinat. fort 9.000
Petrolat liquid 3.000

Add the oil to the ointment very gradually with constant stirring until a smooth, oily mixture is obtained. Keep in a wide-mouthed phial with glass stopper.

Sig. Ol. cinereum, 50 per cent.

Of this the dose is a minim, containing about a grain of metallic mercury.

The injection is made, with antiseptic precautions, on either side of the spinal column, about 1½ inches apart, six injections being placed on each side. The needle is carried obliquely into the muscles. The injections are not painful, but are usually followed by considerable induration and tenderness, which often lasts a week or more. The patient sometimes states that the injection causes a sensation of a blow on the back and is almost immediately followed by a metallic taste in the mouth. About 150 cases, aggregating some 2,000 injections, have been given under my direction with most satisfactory results. The only bad effects in all these cases have been about a dozen local abscesses, and less than half a dozen mild cases of pyæmia. I believe that with care neither of these complications should occur, except very rarely. In over 500 injections given by me there were no bad results of any sort.

There is one point to be borne in mind, viz: often a painful, tender, and even red-denied swelling occurs at the point of injection, which would, if let alone, disappear of itself; opened under the mistaken idea that it is an abscess no pus is found, but a slow-healing wound is left.

The disappearance of symptoms under this treatment is marvelous; skin eruptions fade, fever ceases, and the patient gains flesh and strength. One case, however, of my series, developed acute pulmonary tuberculosis (T. B. in sputum), in the midst

of his course, and died from it, as he was a recently arrived recruit his previous health could not be determined.

As to permanence of results my oldest cases are of about two years standing, nearly all the older cases have gone to the Philippines, but a few who are still under observation continue in perfect health.

A case of gonorrhoeal pyemia was admitted to the United States Army General Hospital, Presidio of San Francisco, Cal., January 15, 1904. The patient complained of pain and swelling in muscles of right side of neck, right arm, right leg, and left arm. No other symptoms were complained of, nor were any discovered, except a slight temperature and coated tongue. In June, 1900, patient had a severe attack of gonorrhea, complicated by an epididymitis of the right side, which he claims was cured after about two months' treatment, when also the discharge from urethra ceased. While en route from Manila, P. I., to San Francisco, Cal., the patient had intercourse at Nagasaki, Japan, but emphatically denies that he had any symptoms of gonorrhea or any inconvenience whatever until about two days before arrival at San Francisco, when he noticed pain and swelling of the muscles above mentioned, namely, of the right sterno-mastoid, the right shoulder, the right thigh posteriorly, and left upper forearm. These localities were tender, red, and swollen, and even at this time no discharge had been noticed from the urethra until the day he was admitted to this hospital. Upon careful examination the day after admittance, January 16, 1904, a circumscribed abscess was found, involving the extensor carpi ulnaris and extensor minimi digiti muscles at the upper part of the forearm, about 1½ inches below the inner condyle of the humerus; another abscess at the lower anterior border of the right sterno-mastoid muscle, just underneath the latter. The right biceps was hard and indurated about its middle, and the flexor muscles of the thigh were in like condition. Also tenderness at the right shoulder just at the anterior border of the deltoid muscle was noted. These inflamed localities were carefully cleansed externally and wet dressings of bichlorid of mercury ($\frac{1}{100}$ solution) applied, and the urethra irrigated twice daily with protargol solution (1 per cent).

January 21 the abscess of the left forearm was opened and about 45 c. c. of pus evacuated. Two smears of this pus were taken for microscopical examination. The cavity was flushed with hot bichlorid solution, packed with iodoform gauze and dressed antiseptically. The abscess at the border of the right sterno-mastoid muscle was opened at this time also, carefully cleaned out, and packed with gauze.

On January 22 the swelling at the junction of the right deltoid and pectoralis major muscles had developed to such an extent that fluctuation was detected and it was promptly opened. A culture of the pus was made on blood serum, this cavity was then flushed out and packed with iodoform gauze, and, as no more abscesses were in evidence or have been since, the patient was placed on light nutritious diet, bowels kept open by salines, whisky given every four hours, and a careful temperature and pulse chart kept daily. The pus from the last abscess, that of the shoulder, was also obtained on a cover glass and prepared for staining for microscopical examination. It showed innumerable gonococci and nothing else, the cocci being more plainly seen in this specimen than any previous ones. A blood count showed a marked leukocytosis, 100,000.

On January 24 the blood serum culture showed a typical growth of the gonococcus in yellowish isolated spots on the culture media.

It is highly probable that this case was one of pyemia of some duration, more or less latent until a new stimulus was awakened by the second infection acquired in Japan, and not fully developing until two or three weeks afterwards.

- Altogether it is an interesting case, and those patients having gonorrhea, suddenly developing abscesses of the muscles, etc., or of internal organs, with no other appreciable cause, can be suspected, with reason, of having gonorrheal pyemia, but the diagnosis should be guarded until the condition is assured by a bacteriological examination.

METHYL ALCOHOL POISONING.

Three cases were reported during the year with two deaths, both occurring in less than twenty-four hours. The symptoms were pain in abdomen, vomiting, headache, albuminuria (2 cases), depression of the heart and respiration, followed in the fatal cases by unconsciousness preceding death.

FILARIASIS.

In the Army as a whole there were 12 cases of this disease reported during the year, with no death and no discharge. All of the admissions occurred among native Porto Rican soldiers in whose blood filarial embryos had been demonstrated. Seven of the cases were lymphadenitis and lymphangitis, 3 were filarial fever, and 2 were diagnosed simply filariasis.

The following extract is taken from an interesting report of Capt. B. K. Ashford, assistant surgeon, U. S. Army, on the prevalence of filariasis in the troops of the Porto Rican Provisional Regiment:

While at Ponce in 1902-3 with Asst. Surg. Joseph Goldberger, United States Public Health and Marine-Hospital Service, I made an extended study of many cases of filariasis. From the wards of the Tricoche Hospital, a large civil institution of Ponce, to which I had access by the courtesy of its chief, Dr. Luis Aguerrevere, I was enabled to obtain abundant material. To these may be added cases seen in the city and in consultation with its physicians. Struck by the decidedly large number of such cases, I was of the belief from what had been seen that about 10 per cent of the people of Ponce were infected.

On change of station to Cayey these observations were furthered by a study of the blood of the 250 native soldiers at this post. Nightly a squad of from 10 to 15 men were examined, and not only did I find that 30 men in all were infected, but that each company contributed about an equal quota. This number of men examined is insufficient to form a correct idea of the proportion of infected here on the island, even without considering the possibility that mosquitoes have fomented an epidemic from a few original cases. The latter objection seems, however, to be not very valid if personal histories from the lips of these men are true. Such histories, when considered in one or two cases, generally admit of doubt. Certain distinctly suspicious attacks of phlebitis, with or without chyluria, and always with swollen and painful inguinal glands, are recounted by nearly all. These attacks, in nearly every case, preceded their enlistment, and when one considered that the soldier is unwilling to give a history of previous disease which might damage his record, and which he himself is personally persuaded is of venereal origin, these histories may be given more credence. It is of additional note that mosquitoes are not the pest here (Henry Barracks) that they are in the immediately adjoining town of Cayey, owing to the strenuous efforts of the former post surgeon and commanding officer to rid the post of them as a general means of sanitation.

My conclusion is therefore that, broadly speaking, the troops of this command have not been the subject of an increasing epidemic of filariasis, but that those infected with the parasite brought it into the service with them. It is extremely difficult to get family histories of the disease, as while generally willing to acknowledge the existence of "buboes" in themselves, they did not care—naturally enough—to thereby involve their parents or other relatives. The type was apparently, in all cases, *filaria nocturna*.

There have been but few physicians on the island who have studied individual cases microscopically. The first to diagnose filariasis by the microscope seems to have been Dr. Jimenez Cruz, of Caguas, P. R., who states that ten years ago he found the circulating embryos in the blood. There has been no attempt whatsoever previous to this report to determine the extent of the infection among the people at large.

ASIATIC CHOLERA.

In 1903 a very noticeable decrease in the number of cases and deaths from this disease is recorded over the preceding year. The admission rate of 2.20 and death rate of 1.42 compares most favorably with the corresponding rates of last year for the whole Army, when 6 per thousand of strength were admitted and 3.54 died.

The 149 cases occurred in the Philippine Islands, and show an admission rate equivalent to 6.26 per thousand of troops serving in the Pacific Islands and China, with a death rate of 4.03. Colored troops escaped infection, while white troops had 105 cases, or 1.76 per thousand of strength, with 68 deaths, equal to 1.14 per thousand men, and the Filipino troops had 44 admissions and 28 deaths, equivalent to 9.19 and 5.85 per thousand, respectively.

ALCOHOLISM.

A slight decrease in the number of admissions for alcoholism in 1903 is noted over the calendar year 1902, but the rate remains slightly higher. From the whole Army 1,670 cases, equivalent to 24.69 per thousand of strength, were admitted, resulting in 12 discharges for disability and 12 deaths. The corresponding data for the previous year were 1,830 admissions, equivalent to 22.65 per thousand of strength, with 7 discharges and 24 deaths, equal to 0.09 and 0.30 per thousand, respectively.

Of the total number of admissions 1,541 were for acute alcoholism, 73 for chronic, and 56 for delirium tremens, equivalent to 22.78, 1.08, and 0.83 per thousand men. Eight deaths resulted from acute alcoholism, equivalent to 0.12 per thousand mean strength; 3, or 0.04 per thousand, from chronic, and 1 from delirium tremens, while 1 discharge was caused from delirium tremens and 11, or 0.17 per thousand, from chronic alcoholism.

Of the 42,264 troops serving in the United States, 1,041, or 24.63 per thousand, were admitted for acute alcoholism, of which 6, or 0.14 per thousand, terminated fatally. Thirty-seven cases, or 0.88 per thousand, were treated for delirium tremens, with 1 discharge, and 51, or 1.21 per thousand, for chronic alcoholism, with 11 discharges, equivalent to 0.26 per thousand men, and 2 deaths.

For troops serving in Cuba and Porto Rico a higher rate than the large one of last year was reported. The rate of admission for acute alcoholism was 51.25, or nearly three times as great as the corresponding rate for the troops in the Pacific Islands and China. There were 4 admissions, or 2.56 per thousand men, for delirium tremens and 2, or 1.28, for chronic alcoholism, with no death and no discharge.

A slight increase in alcoholism is noted in the Pacific Islands and China over the rate of last year. The 420 admissions for acute alcoholism gave an admission rate of 17.63 per thousand troops, resulting in 2 deaths, while of the 15 cases of delirium tremens treated 1 terminated fatally. Twenty admissions, equivalent to 0.84 per thousand, and 1 death resulted from chronic alcoholism.

INSANITY.

A large reduction in the cases of insanity occurred in the Army during 1903, there being only 72 original admissions for the calendar year, equivalent to the low rate of 1.06 per thousand of strength.

Of the cases admitted this year and those remaining in the Government Hospital for the Insane and the army hospitals at the close of the last calendar year, 2 were returned to duty, 2 discharged by special orders, War Department, 1 died en route to the asylum, 3 committed suicide, and 75, or 1.11 per thousand of strength for the whole Army, were discharged for disability, leaving 19 under treatment December 31, 1903.

Of the total number of admissions for the year, 43, or 1.02 per thousand men, occurred in the United States, while 71 of the 75 discharges for disability and the 1 death were reported from home stations.

In Cuba and Porto Rico the high rate of 2.56 per thousand is recorded for the 4 cases admitted to sick report, all being discharged for disability.

The admission rate in the Pacific Islands and China was 1.05 per thousand of mean strength for the 25 cases reported. There was no death and no discharge from this cause among the troops in the Philippines during the year.

EXTERNAL CAUSES.

The admission rate for external causes was 222.68 per thousand men for the 15,063 cases reported in the Army from a mean strength of 67,643 during the year. Of the total number of cases, 120 were discharged for disability, or 1.77 per thousand troops, and 154 died, equivalent to a mortality rate of 2.28 per thousand of strength.

The 10,371 cases in the United States gave an admission rate of 245.39, with 116 discharges for disability, equivalent to 2.74 per thousand, and a death rate of 1.82 for troops serving at home stations.

For the Pacific Islands and China, less than one-half of the total number of cases reported in the United States is recorded, equivalent to an admission rate of 178.27 per thousand of strength, with 3 discharges and 76 deaths, including those killed in battle, equal to rates per thousand of troops on foreign service of 0.13 and 3.19, respectively.

In Cuba and Porto Rico, with a mean strength of but 1,561, the high admission rate of 285.72 is recorded, with but 1 discharge and 1 death.

There were 30 deaths from drowning, equivalent to a rate of 0.44 per thousand, reported for the whole Army during the year, 13 in the United States and 17 in the Pacific Islands and China, a decided decrease when compared with 1902, when the rate reported for the whole Army was 0.61 per thousand of mean strength.

Exhaustion from exposure and fatigue caused the admission of but 48 cases to sick report during the year, equivalent to the small rate of 0.71 per thousand for the whole Army. There was no fatality from these causes. Twenty-two of these cases occurred in the United States, equal to a rate of 0.52 per thousand; in Cuba and Porto Rico 1, equivalent to 0.64 per thousand, and in the Pacific Islands and China 25, or 1.05 per thousand of strength.

The number of cases of heat stroke increased from 85 admissions in 1902 for the whole Army to 198, equivalent to a rate of 2.98 per

thousand during the last calendar year. Of these, 56 or 1.33 per thousand were recorded in the United States; while the Pacific Islands and China had 131 or 5.50 per thousand admissions, and Cuba and Porto Rico 11, or 7.05 per thousand of mean strength, with the one fatal case reported in the Army for the year.

One death occurred in the Philippines and one admission was reported with recovery as a result of being struck by lightning.

From venomous bites, stings, and wounds, 162 entries are recorded on sick report for the year, equivalent to an admission rate for the whole Army of 2.39 per thousand, with no death and no discharge, a decided decrease in the number of admissions for 1902, when 535 cases were reported.

Of the admission rate for external causes for the whole Army of 222.68 per thousand of strength, 121.46 per thousand were for abrasions, burns, sprains, and wounds contused, incised, lacerated, and punctured. There were 613 fractures, exclusive of gunshot, equivalent to 9.07 per thousand men, with 25 discharges for disability and 12 deaths, equal to rates per thousand of 0.37 and 0.18, respectively. Two hundred and forty-three dislocations, or one less than in 1902, were reported, with 4 discharges and 3 deaths.

In the Philippine Islands 6 men were killed in action, exclusive of gunshot, and 18 wounded, of which 3 died and 1 was discharged for disability. The following tables show in detail the character and location of the wounds, the weapon used, and the disposition in each case:

Wounds other than gunshot received in action (exclusive of deaths not on sick report).

Character and location of wound.	* Weapon.					Disposition.				
	Bolo.	Campan.	Dagger.	Kris.	Spear.	Total.	Duty.	Certificate of disability.	Died.	Expiration of term of service.
Head:										
Flesh	1			1		2	2			
Fracture					1	1				1
Neck	1		1			2	1		a 1	
Thorax:										
Nonpenetrating					1	1	1			
Penetrating	1					1	1			
Abdomen, penetrating				1		1			1	
Shoulder, flesh	1					1	1			
Arm, flesh		2		1		3		b 1	c 1	d 1
Forearm, flesh		1				1				1
Hand, flesh				1		1	1			
Thigh, flesh		2		1		3	3			
Leg, flesh	1					1	1			
Total	5	5	1	4	3	18	11	1	3	1

a Wounded July 20, 1903; died day after injury of shock following operation for traumatic aneurism of left common carotid artery.

b Wounded April 10, 1903; amputation left arm, middle third, on date of injury; April 14, 1903, shoulder joint amputation; discharged on surgeon's certificate of disability August 14, 1903.

c Died day of injury of hemorrhage from severed axillary artery.

d Wounded April 10, 1903; amputation left arm, middle third, April 13, 1903, partial reamputation April 26, 1903; removal of humerus 1 inch higher to gain sufficient flap; discharged at expiration of service, December 25, 1903.

Killed in action by wounds other than gunshot wounds.

Character and location of wound.	Bolo.	Kris.	Spear.
Neck		a 1	.....
Thorax, penetrating			1
Abdomen, penetrating			1
Thigh, flesh			b 2
Leg, flesh	c 1		.....
Total	1	1	4

^a Head nearly severed.^b Femoral vessels severed in both cases.^c Died of hemorrhage from divided popliteal artery.

GUNSHOT INJURIES.

At the close of the last annual report there remained under treatment 14 cases of gunshot wounds, 5 of which were received in action and 9 not in action. Of those received in action, 2 were discharged for disability and 3 were returned to duty. Of the 9 cases which were not battle wounds, 5 were returned to duty and 4 were discharged for disability, as shown in the following tabulation:

Disposition of gunshot-wound cases remaining in hospital January 1, 1903.

Character and location of wound.	How received.					
	In action.			Not in action.		
	Remaining last report.	Disposition.		Remaining last report.	Disposition.	
		Duty.	Certificate of disability.		Duty.	Certificate of disability.
Face, fracture	1	1				
Shoulder, flesh				1	1	
Forearm, fracture	1		1			
Thigh:						
Flesh	2	2		2	1	1
Fracture lower third	1		1			
Kneejoint				1	1	
Leg fracture				2	1	1
Foot:						
Flesh				2	2	
Fracture				1	1	
Total	5	3	2	9	5	4

NOTE.—In addition to the above, there were three discharges for old gunshot wounds not on sick report during the years 1902-3.

During the year 1903, 36 men were killed by gunshot, only 7 of whom met their death in action. Seven of the deaths were accidental, 19 suicidal, and 3 homicidal. The following table gives a summary of these cases:

Killed by gunshot, 1903.

Character and location of wound.	How received.					Nature of missile.							
	In action.	Not in action.			Total.	In action.				Not in action.			
		Accidental.	Suicidal.	Homicidal.		Krag-Jørgensen.	Remington.	Mauser.	Missile not stated.	Krag-Jørgensen.	Revolver.	Springfield.	Missile not stated.
Head, fracture.....	3	3	10	...	16	1	1	1	...	7	5	1	...
Thorax, penetrating.....	2	3	8	2	15	...	...	...	2	5	4	2	...
Abdomen, penetrating.....	...	...	...	1	1	...	2	...	...	...	...	...	1
Thigh, flesh.....	2	...	2	...	2	...	...	...	...	...	...	...	...
Wound not described.....	...	1	1	...	2	...	...	...	...	1	...	...	1
Total.....	7	7	19	3	36	1	3	1	2	12	10	3	4

^a In one case the popliteal, in the other the femoral, artery was severed.

Besides the 36 men killed outright by gunshot there were 196 cases of gunshot injury brought to the hospitals for treatment, of which 126 were returned to duty, 16 discharged for disability, 21 died, 4 were otherwise disposed of, and 28 remained under treatment at the end of the last calendar year. Of the 196 cases admitted during the year only 43 were received in action, but 108 of the remainder were reported as having been incurred in the line of duty, 32 not in the line of duty, 9 suicidal, and 4 homicidal. The gunshot casualties of battle amounted, therefore, to 7 killed and 43 wounded, a total of 50, the killed constituting 14 per cent of those struck; but as 3 of the cases admitted to hospital died from the effects of their injuries, the deaths among those struck constituted 20 per cent.

Five cases of fracture of cranium were reported, 4 of which died and 1 remained under treatment at the end of the calendar year. This case was trephined, branch of cerebral artery ligated, but the ball was not recovered.

Four cases of fracture of facial bones were admitted to sick report, 1 of which proved fatal, while the others were returned to duty.

The one case of fracture of the spine, which occurred not in the line of duty, terminated fatally.

The thorax was penetrated 14 times, 3 of which were fatal. In 1 of the 2 cases remaining under treatment December 31, 1903, resection of the eighth and ninth ribs for drainage of empyemic cavity was done.

Nine cases of penetrating wound of abdomen were reported, 8 of which were fatal and 1 was returned to duty. In 1 case laparotomy, incision 6 inches long in median line, rent 1 inch in diameter in posterior wall of bladder, was sutured; while in a second case laparotomy, resection 5 c. m. of ileum, anastomosis with Murphy's button, was done.

The arm was reported as having been fractured 9 times, with 1 case returned to duty, 6 discharged for disability, and 2 remaining at end of year. Amputation was performed in 4 of these cases, while resection was done in a fifth, all of which resulted in recovery.

Five cases of fracture of forearm appear on the reports of sick and

wounded, 1 remaining under treatment at the end of the calendar year. Three of the cases were returned to duty and 1 was discharged for disability.

Among the 16 flesh wounds of the thigh there was 1 death from gangrene, acute emphysematous.

The carpus or metacarpus was fractured in 15 instances, of which 6 cases were returned to duty, 4 discharged for disability, 1 discharged by order, 3 remained on sick report at end of year, and 1 died from tetanus after operation for removal of trapezium, trapezoid, external half of scaphoid and disarticulation first finger and second metacarpal, ligation of radial and superficial palmar branch of ulnar artery and radial extremity of deep palmar arch.

The two fractures of middle third of thigh reported both terminated fatally. In one a resection of comminuted fracture was done and in the other amputation at junction of middle and upper thirds was performed.

The 1 case of fracture of leg reported in 1903 was returned to duty.

The foot was fractured in 9 cases, including 1 case of fractured toe. One case in which the great toe was amputated remained under treatment December 31, 1903, while no fatal case was reported from the fractures of the foot.

A summary of the data concerning these gunshot wounds is given in the following tabulations:

- A. Gunshot wounds received in action.
- B. Gunshot wounds other than battle wounds.
- C. All gunshot wounds.
- D. Gunshot wounds which terminated fatally.
- E. Surgical operations for gunshot wounds.

A.—Gunshot wounds received in action (exclusive of deaths not on sick report).

Character and location of wound.	Nature of missile.						Disposition.				
	Krag-Jørgensen.	Mauser.	Remington.	Revolver.	Slug.	Missile not stated.	Total.	Duty.	Certificate of disability.	Died.	Remaining on sick report.
Head:											
Flesh						1	1	1			1
Fracture						1	1			1	
Face, flesh		1			1	1	3	3			
Neck		1	2				3	3			
Thorax, nonpenetrating			2				2	2			
Abdomen:											
Nonpenetrating			1				1	1			1
Penetrating			1	1			2			2	
Perineum, genital and urinary organs						1	1	1			1
Shoulder, flesh	1		1				2	2			2
Arm:											
Flesh			2		1		3	3			3
Fracture	1		3			1	5	1	3		1
Forearm:											
Flesh						2	2	2			2
Fracture		1				2	3	2	1		3
Hand, flesh						1	1	1			1
Fingers, fracture						1	1				1
Thigh, flesh			6			2	8	7		1	8
Leg, flesh			1		1	1	3	3			3
Foot, flesh						1	1	1			1
Total	2	3	19	1	3	15	43	33	4	3	43

B.—Gunshot wounds other than battle wounds (exclusive of deaths not on sick report).

Character and location of wound.	How received.				Nature of missile.								Disposition.				
	In line of duty.	Not in line of duty.	Suicidal.	Homicidal.	Total.	Krag-Jørgensen.	Springfield.	Remington.	Winchester.	Revolver.	Shotgun.	Explosion of cartridge.	Explosion of powder.	Bursting of gun.	Breechblock.	Missile not stated.	Total.
Head:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Face:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Neck:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Stem:																	
Nonpenetrating.....	1	1			2												
Penetrating.....	1	1			2												
Abdomen:																	
Nonpenetrating.....	1	1			2												
Penetrating.....	1	1			2												
Back and hip, flesh:																	
Shoulder, flesh.....	1	1			2												
Arm:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Forearm:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Hand:																	
Flesh.....	1	1			2												
Carpus and metacarpus, fracture.....	1	1			2												
Fingers, fracture:																	
Thumb.....	1	1			2												
Thigh:																	
Flesh.....	1	1			2												
Fracture middle third.....	1	1			2												
Leg:																	
Flesh.....	1	1			2												
Fracture.....	1	1			2												
Ankle joint:																	
Foot, flesh.....	1	1			2												
Tarsus and metatarsus, fracture.....	1	1			2												
Toes, fracture:																	
.....	1	1			2												
Total	108	32	9	4	153	50	8	1	4	59	10	4	1	2	1	18	153
																	153

a Died of tetanus.

c Discharged on surgeon's certificate of disability for insanity.

b Two of these were suicides.

a Suicide.

E.—Surgical operations for gunshot wounds.

Character and location of wound.	Operation.	Result.			Nature of missile.								
		Recovered.	Died.	Remaining last report.	Remington.	Revolver.	Shotgun.	Bursting gun.	Breech block.	Explosion of powder.	Slug.	Missile not stated.	
Head, fracture	Trephining; branch of cerebral artery ligated; ball not found			1	1								
Thorax, penetrating	Resection of eighth and ninth ribs for drainage of empyemic cavity, V incision.			1									
Abdomen, penetrating	Laparotomy: 6 inches long in median line; rent 1 inch in diameter; posterior wall of bladder sutured.			1		1							
Do.	Laparotomy: Resection 5 c. m. ileum, anastomosis with Murphy button.		1		1								
Do.	Laparotomy, exploratory		1		1								
Perineum, genital, and urinary organs.	Incision of scrotum for drainage; three days later, curettage and drainage of resulting fistula.	1										1	
Arm, fracture	Amputation at shoulder joint.	1							1				
Do.	Amputation upper third, circular method	1											
Do.	Amputation junction upper and middle thirds	1			1								
Do.	Amputation junction middle and lower thirds, circular method	1											
Do.	Resection lower third of humerus	1			1								
Carpus and metacarpus, fracture	Disarticulation first finger and second metacarpal, removal of trapezium, trapezoid, and external half of scaphoid, ligation of radial and superficial palmar branch of ulnar artery, and radial extremity of deep palmar arch.	1								1			
Do.	Fractured third and fourth metacarpals removed, corresponding fingers amputated.	1										1	
Do.	Splintered part of fourth metacarpal removed, extensor tendon sutured, incision at entrance of wound, and ulnar artery ligated.	1			1								
Do.	Amputation left middle finger, including head of corresponding metacarpal	1			1								
Do.	Index finger with fragment of metacarpal removed; third metacarpal wired.			1									
Do.	Carpus shattered, amputation forearm 1 inch above wrist.	6	1	3	3	1	1	1				3	
Fingers, fracture	Finger amputation.												
Thigh, flesh	Excision of gangrenous skin and drainage.		1										
Do.	Oct. 25, 1903, comminuted fracture; Dec. 30, 1903, resection.		1										
Thigh, fracture middle third	Amputation junction upper and middle thirds.	1			1								
Do.	Wounded Aug. 15, 1902; amputation Sept. 11, 1903.	1										1	
Thigh, fracture lower third	Tract of missile above external malleolus laid open, curettage and excision portion of external saphenous nerve.	1											
Leg, flesh	Curettage of necrosed tibia.	1										1	
Leg, fracture	Wounded Apr. 6, 1902; bullet located by X ray; removed from head of tibia Jan. 13, 1903.	1				1							
Do.					1								
Toes, fracture	Amputation of great toe.												
Total		19	7	8	13	3	3	3	2	1	1	1	8

SANITARY CONDITIONS.

DEPARTMENT OF THE EAST.

The chief surgeon reports that the sanitary condition of the posts is, as a rule, good.

Fort Niagara, N. Y.—An epidemic of typhoid fever occurred at this post in December, 1903, and January, 1904, which was attributed to the use of unsterilized water from the Niagara River in violation of post orders, sterilized water being furnished by the Quartermaster's Department. There were 8 cases, with no death. Test wells have recently been driven at this post with a view of obtaining an adequate and wholesome supply of water.

Fort Terry, N. Y.—The water supply at Fort Terry has been reported as contaminated by sewage and stable excrement, but measures are now under way to remove the causes of contamination.

Fort H. G. Wright, N. Y.—The water supply at Fort H. G. Wright has been greatly improved by the installation of a water still of 1,000 gallons capacity and an additional well.

Fort Du Pont, Del.—The water supplied this post has been found objectionable in odor and taste, and orders have been given for boiling and filtering the water used for drinking purposes. Estimates for furnishing certain buildings with potable water stills have also been forwarded. Drainage in wet weather is exceedingly poor.

Fort Myer, Va.—The water supply has been carefully watched, and measures taken to keep the post filter in working order.

Fort Constitution, N. H.—The water supply at this post and Fort Greble, R. I., has repeatedly been reported as inadequate, being supplied mostly by boat during the summer, and recommendation made in each case that water be piped from adjacent sources. Specifications and estimate for water supply for Fort Greble were forwarded to the Chief of Staff May 7, 1904, while action relative to the water supply of Fort Constitution has been suspended until a site for the new buildings to be erected at that post has been selected.

Fort Slocum, N. Y.—The construction of one double barrack for two companies at this post, which has been approved by the Secretary of War, will no doubt ameliorate the conditions at this station so far as the quartering of recruits is concerned. At present they are quartered in tents.

Fort Preble, Me.—Drainage and sewerage reported as incomplete; much grading about the post is an urgent necessity. New quarters for noncommissioned officers are very much needed. The surgeon and commanding officer recommend the purchase, with a view to control, of an insanitary plot of ground adjoining the reservation. The site with a little grading, etc., would be an admirable location for the officers' quarters, gymnasium, etc., so much needed at this post.

West Point, N. Y.—Sanitary condition very good; sewerage complete and satisfactory; water supply sufficient and of good quality.

Washington Barracks, D. C.—Boiled water used for drinking purposes.

Fort Wadsworth, N. Y.—Health of command very poor, owing to defective sanitary conditions of the casemate barracks occupied by the men. They are poorly lighted, leaky, and generally insanitary. Drainage poor. Reconstruction of post contemplated.

Fort Strong, Mass.—Surgeon recommends that additional barrack building be supplied, as the air space per man is wholly insufficient.

Fort Smallwood, Md.—Buildings at this post are unsuitable for quarters. Water supply is liable to contamination. Water sent from Fort Howard three times a week.

Fort Revere, Mass.—Water from an artesian well supplying the post was pronounced unfit for drinking purposes and water is now obtained from the Hingham water-works.

Fort Porter, N. Y.—Guardhouse is too small.

Fort Mott, N. J.—Buildings largely temporary and inadequate.

Fort Monroe, Va.—Public buildings not recommended for removal in good sanitary condition. The casemates occupied as quarters need more sunlight, heat, and ventilation. In the opinion of the surgeon nothing short of removing the entire structure and replacing it with buildings of modern design will ever remedy this matter to the entire satisfaction of all concerned. Water from the mains is of doubtful quality. The drinking water furnished by the condenser is excellent, but somewhat limited in quantity.

Fort McHenry, Md.—Quarters occupied by troops are very old and dilapidated and are very hard to keep clean; unprovided with sufficient ventilation; number of win-

dows insufficient in many rooms for proper lighting; bathing facilities improvised; plumbing in detached water-closets defective.

Fort Hamilton, N. Y.—Some of the buildings in bad repair and others unsightly as well. None of the barracks is properly heated.

Fort Carroll, Md.—The water is reported as unfit for use and recommendation is made that sufficient water be provided to supply the demand or a small distilling plant be installed.

Fort Andrews, Mass.—The surgeon notes that the frame buildings are insufficient to house the men, and recommends that suitable structures be erected.

Fort Jay, N. Y.—Sewers in good repair, but owing to scarcity of water are not flushed out. Water supply is absolutely inadequate for domestic purposes.

DEPARTMENT OF THE GULF.

The chief surgeon reports that the health of the troops and the sanitary conditions generally have been good during the year. There have been very few cases of typhoid fever reported during the period. The source of infection of the seven cases occurring at Camp G. H. Thomas for the most part has been traced to the drinking of unboiled water from creeks and branches during the marches and while the troops were on duty at the target range at Waco, Ga. The patients suffering from this disease were isolated, bedding, excreta, etc., disinfected, the camp being kept in a sanitary condition. It is probable that some of these cases originated at Camp Thomas from the use of water from Chickamauga Creek. All possible precaution to prevent the unnecessary use of this water was taken and to render it harmless where its use was necessary. No death occurred from typhoid fever at this station.

Two cases of typhoid were reported from Key West Barracks, Fla., with one death. The source of infection has been traced to the city of Key West, where, it is reported, the disease has been quite prevalent. The patients were isolated and sanitary measures adopted to prevent the spread of the disease.

The following are extracts from the sanitary reports of the posts in the department:

Fort Caswell, N. C.—Drainage reported as fair and recommendation made that necessary filling in be done as soon as practicable. Heating of officers' quarters defective; a central heating apparatus is suggested. Water supply defective. New quarters recommended for noncommissioned officers. The commanding officer was directed to submit estimates for carrying into effect the recommendation of the surgeon.

Fort Barrancas, Fla.—Walls and ceilings of several of the squad rooms are damp and covered with mold. Closet and urinal in bathroom are in an unsatisfactory condition. Barracks are poorly lighted and ventilated, old and damp and the plumbing is worn; they are almost unfit for occupancy. Lavatory facilities urgently required.

Fort Fremont, S. C.—The housing of the command is defective, most of the buildings being temporary. Drainage has been improved, but considerable work will be required to make it good.

Key West Barracks, Fla.—Insufficient barracks for men and officers; insufficient amount of fresh water.

Fort McPherson, Ga.—Buildings are in good sanitary condition and police of grounds has been excellent. The plumbing is old but carefully watched and repaired when necessary.

Fort Screven, Ga.—The surgeon recommended that old style of barracks be done away with, and that numerous drains and ditches throughout the reservation be filled and replaced by a system of superficial drains.

Fort Moultrie, S. C.—Sewerage system rendered useless by insufficient water supply; no proper sinks for use when water supply gives out. Trough latrines have been asked for.

Camp G. H. Thomas, Ga.—Screens recommended for all mess rooms and kitchens

to exclude flies. Buildings are poor shelter from cold in winter. The Chickamauga Creek water used for cooking and washing dishes is a dangerous source of typhoid fever.

DEPARTMENT OF THE LAKES.

The sanitary conditions generally in this department are reported as good

Columbus Barracks, Ohio.—The surgeon reports the city water very hard and should be boiled before being used for drinking purposes.

Rock Island Arsenal, Ill.—The hospital building is a temporary frame building and is now in a very bad condition and almost untenable.

Fort Thomas, Ky.—Water supply is ample, but in view of possible contamination water to be used for drinking purposes is first boiled.

DEPARTMENT OF THE MISSOURI.

The chief surgeon of the department reports that the imminence of an epidemic of typhoid fever at Fort Leavenworth, Kans., has been the most menacing health problem of the year. Despite the various sanitary precautions taken and the drastic measures recommended by the surgeon and enforced by the commanding officer, typhoid fever has remained endemic practically throughout the entire year at this post. The source of infection is undoubtedly to be found in the impure water supply, the water furnished being, according to the post surgeon, only a dilution of the post's own sewage. The new water-purification plant was reported in March as almost completed; whether it has yet been put in operation this office has not been advised. The sewage-disposal plant that has been in process of construction for some months past has not yet been tested. Meanwhile the drinking of sterilized water has been as stringently enforced as could be effected by repeated warnings and orders and the court-martialing of detected transgressors. During the year 47 cases of typhoid fever have been admitted to sick report at Fort Leavenworth, new cases having appeared in eleven out of the twelve months of the year.

Thirty-six additional cases of typhoid from other posts in the department have been reported during the year. Of the cases occurring at Jefferson Barracks, Mo., nine appeared during the month of August among troops recently returned from target practice. It was the opinion of the surgeon that the disease was contracted at the Arcadia rifle range. The water supply at Jefferson Barracks, however, while not so impure as at Fort Leavenworth, is yet regarded as unsafe for drinking purposes unless boiled. At the instance of the former surgeon, Major Raymond, the sinking of an experimental tubular well, in the hope of securing a potable water supply for the garrison, was begun in February. Report as to the success of the venture has not been communicated to this office.

Of the 18 cases of typhoid fever which were reported from Fort Riley, Kans., 10 developed in October among the troops assembled for the fall maneuvers. The board of medical officers appointed to investigate the origin of the outbreak reached the conclusion that the source of infection was not at the post, but that the disease had been contracted through drinking water from wells while troops were on recent practice marches.

Four out of the total of 83 cases of typhoid fever in the department have resulted fatally.

While the number of pneumonia cases was not so large by four this year as in the preceding, the death rate from this cause has been the highest reached in years. More than one-third of the cases, 16 out of 47, have proved fatal. The disease has not been confined to any one post or to any particular month, but has appeared among various garrisons and at varied seasons.

An epidemic of measles occurred at Fort Leavenworth in March and one at Fort Riley, Kans., and Fort D. A. Russell, Wyo., in April.

Not only at Fort Leavenworth and Jefferson Barracks, but at Forts Meade, S. Dak., Robinson and Niobrara, Nebr., has the water supply been a matter for comment in certain of the monthly sanitary reports. The purity of the water at Forts Meade and Robinson has not been questioned, but the supply at Fort Meade has been pronounced wholly inadequate to cope with a fire in case such an emergency should arise, while at Fort Robinson a scarcity, apparently due to insufficient capacity of the pumping apparatus, was reported last July. It was understood that an effort would be made to remedy the shortage at Robinson, but so far no action has been taken toward affording increased security at Meade. At Niobrara, Nebr., the danger is one of possible contamination rather than actual existing impurity. The several springs which constitute the source of this post's supply are not so protected as to preclude the entrance thereto of organic matter.

The subject of inadequate guardhouse facilities has been agitated throughout the greater part of the year at Forts Crook and Leavenworth and Jefferson Barracks. The crowding of prisoners and consequent insufficient air space, the lack of bathing facilities, and the absence of water-closet conveniences were the reported insanitary conditions existing at the guardhouses of these posts. At Fort Leavenworth the transfer of garrison prisoners to new quarters in February somewhat rectified the unwholesome state of affairs, while at Jefferson Barracks it is understood that either the present guardhouse will be enlarged or a new one erected. The proposed utilization of the Federal prison at Leavenworth for the incarceration of general military prisoners would appear to be a desideratum as affording permanent relief from congested conditions that have obtained at these several posts.

The barracks available for quartering troops at Jefferson Barracks are reported as frequently taxed beyond their capacity consistent with proper sanitation.

In the opinion of the respective surgeons the barracks at Forts Meade and Niobrara are poorly equipped in point of ventilation. Steps looking to the remedy of this evil at Fort Meade have been taken. It would seem that the health of the command at Fort Niobrara is still further jeopardized during the summer season by the barracks being so ramshackle as to render it impracticable, in the opinion of the commanding officer, to make these buildings proof against invasion by flies and mosquitoes.

The clouds of dust raised by the high winds at Fort Robinson have been a source of a great deal of annoyance among the members of that garrison. The inhalation of the dust gives rise to numerous cases of inflammation of the nose, throat, and bronchi.

Fort Niobrara, as was the case in each of the two preceding years, has the best health record of all posts in the department, only 1.7 per cent of the command having been rendered noneffective by sickness and injuries.

Fort Meade has had the highest percentage of sickness, 5 per cent. This, however, may not be a just comparison, inasmuch as this post has been in the department only six out of the twelve months.

As in former years the venereal cases have outnumbered every other form of disease. It is interesting, however, to note that, as compared with the preceding year, the number of venereal infections were lessened by 523, the percentage of sickness from this cause falling from 24.7 per cent to 14.2 per cent of the average strength of the command for the respective years. The decrease in percentage of malarial fever cases has been still further emphasized in the year just ended, 12.6 per cent, 8.2 per cent, and 5.9 per cent are the figures for the last three years. This improved showing is attributable no doubt to careful screening of post buildings and to incessant warfare upon the mosquito and his breeding places.

Congress appropriated \$40,000 for the construction of a new hospital at Fort Riley. A new and modern building is much needed at this post, as the present hospital is reported as too small, obsolete in plan, unsatisfactory in ventilation, and without a suitable operating room. As the amount of the appropriation is much too small to provide a new hospital commensurate with the size of this large post, it is proposed to erect the building by sections, utilizing the present structure in the general plan.

DEPARTMENT OF DAKOTA.

The chief surgeon reports as follows:

The health of the troops in the department during the year has been very good, showing an improvement at nearly all posts over most of the years for the past decade.

Fort Assiniboine, Mont.—No expenditure for repairs to the hospital was authorized and this office was informed that it was not deemed advisable to repair the present structure only as absolutely necessary for the comfort of the sick, for the reason that funds would be asked for in the annual estimate for the year ending June 30, 1905, with a view of securing an appropriation from Congress for the erection of a new hospital building. The hospital building is unsuitable and inadequate for the requirements of the present command.

Fort Harrison, Mont.—The ratio per 1,000 for admissions to sick report, discharges, deaths, and men constantly sick was lower at this post than at any other in the department.

Fort Lincoln, N. Dak.—The post has water and sewer systems. The sanitary condition was the cause of no unusual complaint, although the water from the water system of the post is not potable. Under the existing circumstances water for drinking and culinary purposes is obtained by purchase at Bismarck and is secured from the Missouri River.

Fort Snelling, Minn.—The hospital at Fort Snelling has been in good condition during the year but at times, owing to limited space, it was inadequate for the best accommodations required. To enlarge the hospital an item of \$50,000 was included in the annual estimate to Congress for the fiscal year ending June 30, 1905. The amount appropriated appears to be specified as \$35,000 to enlarge the hospital at Fort Snelling, Minn.

DEPARTMENT OF TEXAS.

The chief surgeon reports that public buildings and grounds generally are in good condition except at Forts Brown and Clark and Jackson Barracks. At Fort Brown, Tex., the surgeon recommended that an inspector be sent to determine the fitness of the barracks for occupancy, and reported the buildings as old, out of repair, and the dormitories as not furnishing sufficient air space per capita for the men.

After an inspection by the department commander and the Chief Quartermaster the latter reported the buildings to be in a condition far from warranting their condemnation, and that sufficient air space per capita may be had by removing the ceilings and thereby adding the air space in the lofts of the buildings. At Jackson Barracks, La., the surgeon reports the remodeling of post and that this will correct existing insanitary condition of buildings. At Fort Clark, Tex., the surgeon reports the public buildings as old, crumbling, and in need of repair, but states that the cost of repairs would be so much as to constitute wasteful extravagance, and recommends that the post be either rebuilt or abandoned, the commanding officer being of the opinion that the buildings are not worth cost of repairs and that a new post should not be built anywhere in the vicinity. The surgeon at Fort Reno, Okla., reported the barracks occupied by Company G, Thirtieth Infantry, as inadequate, but that the proposed additions will remedy the defect mentioned.

At Fort Sam Houston, Tex., ground is now being broken for extensive additional barracks and quarters.

In the last annual report mention was made of unsatisfactory sewerage conditions at Jackson Barracks, La., and Fort Ringgold, Tex. The former will be remedied by remodeling of the post, and the latter was in the most part corrected by extension to sewer system completed August 19, 1903. During the year a sewer system has been installed at Fort Brown, but all house connections have not yet been made, waste water from officers' line and hospital still emptying into lagoon in rear of officers' quarters. Action is now pending on estimates for a sewer system at Fort McIntosh, Tex. Drainage system at Fort Reno is reported obsolete, but disposal of wastes satisfactory. Disposal of wastes throughout the department reported as satisfactory.

The water supply is reported as generally good and sufficient throughout the department except at Fort Bliss, Tex., where the surgeon reports an insufficient reserve for emergencies, but quantity adequate for ordinary needs. At Fort Brown, from where similar report of insufficiency has been made, contract has been made for the erection of a new 50,000-gallon steel tank. Distilled water is used for drinking purposes at posts having distilling plants or ice machines.

With a view to the prevention of malaria, barracks and quarters have been screened, pools of standing water drained and filled in or treated with petroleum, and during mosquito months men compelled to sleep under mosquito bars.

The number of admissions for venereal diseases continues to be large, there being 619 during the year out of a total of 4,127 for all causes, equal to a fraction over 14 per cent of the total admissions, a part of which, at least, can be attributed to the number of cases discovered and put under treatment as a result of the regular physical inspections carried on in this department, as without these inspections many cases not borne on sick report would remain concealed and receive only clandestine treatment by the sufferers. The good results of these inspections may be inferred from the total number of admissions, 619, and the total number of discharges for disability on account of venereal diseases, 11—less than 2 per cent becoming finally unfit for the service.

Several sporadic cases of typhoid fever occurred at different posts in the department, and 3 at Fort Brown in June, 1904, with no death

from that cause. The water supply is reported as the source of infection at Fort Brown. Proper precautionary measures have been taken and no further cases have developed.

DEPARTMENT OF THE COLORADO.

SUMMARY OF SANITARY REPORTS FOR THE YEAR.

Fort Apache, Ariz.—A new sewer system is being installed. Water is obtained from river; boiled before drinking. General sanitary conditions reported as good.

Fort Douglas, Utah.—Public buildings and grounds in generally good condition; many of the outbuildings in bad repair.

Fort Duchesne, Utah.—Water supply abundant, quality fair; boiled before using. Sanitary conditions good.

Fort Grant, Ariz.—Public buildings in poor state of repair; water supply insufficient.

Fort Logan, Colo.—All sanitary conditions reported as good.

Fort Washakie, Wyo.—All buildings very much in need of repair. Barracks overcrowded. Bathing facilities inadequate. No sewerage system.

Whipple Barracks, Ariz.—Buildings old and in poor repair. New buildings in course of construction. A new 12-bed hospital has been authorized for this post. Sewer system old and unreliable. Dry earth latrine system in general use.

DEPARTMENT OF CALIFORNIA.

The chief surgeon reports sanitary conditions as satisfactory with few exceptions. There has been 1 case of typhoid fever at Fort McDowell, 1 at depot of recruits and casuals, and 3 at the Presidio, apparently imported from the East. An isolation ward has been completed at Alcatraz Island, the hospital at Fort Rosecrans has been occupied, and satisfactory progress is being made on the hospital at Fort McDowell, ground having been broken April 27, 1904. Overcrowding of barracks at Company of Instruction Hospital Corps No. 2 and at Fort Baker has been reported during the year and satisfactorily corrected. The water supply at Benicia Barracks is being improved by the erection of a large storage reservoir. Other sanitary matters in the department are satisfactory.

The following extracts are taken from the sanitary reports of posts in the department:

Ord Barracks, Cal.—Barracks and guardhouse too small. Hospital completed in October, 1903, too small for needs of the post, but in view of the fact that the post of Ord Barracks is a cantonment, no funds will be expended there for the construction of a large permanent hospital until the status of the garrison is distinctly established.

San Diego Barracks, Cal.—City water used, and is of fairly good quality; reported as alkaline and the cause of some mild cases of diarrhea during August and September, 1903.

Presidio of San Francisco, Cal.—The surgeon reports that sanitary conditions are satisfactory.

Fort McDowell, Cal.—Overcrowding of barracks noted at different times during the year. June 30, 1904, the surgeon reports that each organization is now quartered in barracks without crowding.

Fort Miley, Cal.—The sanitary conditions are reported as good.

Fort Mason, Cal.—Sanitary conditions are satisfactory.

Benicia Barracks, Cal.—Public buildings are old, requiring constant repairs, more or less. Sewerage and plumbing, including the water system and bathrooms in the barracks, require repairs and general overhauling. The water supply is at present defective. The tank into which the water from the Benicia waterworks is pumped for distribution shows a deposit of mud, algae, fish, and other debris of vegetable matter from 1 to 2 inches each month. No facilities are provided to keep the tank free from the impurities. Adoption of some kind of modern filter is recommended.

Fort Baker, Cal.—The barracks of the Thirty-Second Company Coast Artillery are overcrowded; the surgeon recommends that at least 20 men be removed from this building.

Alcatraz Island, Cal.—Barracks occupied by enlisted men very much overcrowded. The casemates can not be properly ventilated and are damp and unfit for quarters. The barracks proper are old and poorly ventilated.

DEPARTMENT OF THE COLUMBIA.

The sanitary condition of the posts in this department is satisfactory as a rule. The following exceptions are noted:

Old buildings with defects as to ventilation are reported at Boise Barracks, Vancouver Barracks, and Fort Walla Walla. These are being remedied by new construction under way or proposed. Temporary buildings were occupied by the commands at Fort Worden for a portion of the year, but new barracks are now complete. The new 6-bed hospital at Fort Casey is reported as of inadequate capacity for the strength of command and also as lacking facilities for bathing. Fort Flagler also reported insufficient hospital accommodation and a 12-bed structure has been allowed. The troops at Fort Ward are in a temporary building. At Skagway, about to be abandoned, the houses are rented and not arranged to the best advantage. The grounds are all reported as well policed.

The surgeon at Boise Barracks recommends construction of sewer for barracks and connection with city system, but in view of rebuilding of post, as a temporary expedient, dry-earth closets have been asked for. Vancouver Barracks reports trouble with frequent blockage of sewer and the commanding officer states that a new system in connection with construction of post is under consideration. Fort Walla Walla has a recommendation for modern closets for barracks and connection with sewer system, which is disapproved, as the buildings are so old that they will have to be torn down and replaced if the post is to be continued. The surgeon at Fort Egbert was authorized to expend mineral oil to cover swamp in neighborhood to prevent the breeding of mosquitoes.

The water supply has been reported as bad at Fort Casey. A permanent supply for this post has been located and steps are now being taken to render this supply available as soon as possible. Forts Flagler and Worden report equally bad conditions. At Fort Flagler the plumbing is in constant need of repairs owing to corrosive action of water. Boards convened for the purpose of securing a suitable supply have recommended obtaining water from the Olympic Mountains, there being no nearer permanent source of pure water for either of these posts. Fort Stevens has also difficulties to overcome in this regard, but recent experimental wells may solve the problem. The surgeon at Fort Egbert states that the well from which water is obtained is liable to infection from drainage of post and favors the use of a spring in the hill behind the quartermaster's stables.

The clothing is reported as good and suitable to the climatic conditions.

Habits of the men have been stated from good to excellent.

Reports show that the food supply has been ample and well prepared. Fort St. Michael reports an absence of fresh vegetables from November, 1903, until opening of navigation, June, 1904.

The surgeon at Vancouver Barracks recommends as a sanitary measure the establishment of a steam laundry for the post, to insure greater cleanliness and less liability of introduction of disease from without.

PHILIPPINES DIVISION.

The chief surgeon reports:

The aggregation of troops in larger garrisons, carried out last year, has been continued; the concentration resulting in the reduction of the number of garrisoned stations from 128 on June 17, 1903, to about 112 at the present date, many of these being temporary stations of scouts in the field. The gradual change from camps to permanent posts with barracks, quarters, and hospitals of durable construction is placing the troops under approximately normal sanitary conditions and enhances the amelioration of service in the Philippines, because of the larger amount of social life, betterment of supplies on account of accessibility of the new posts, improved condition of water supply, drainage, and protection from damp ground and from mosquito resorts.

Malaria has declined largely through the universal use of mosquito bars and the prophylactic measures now general. Typhoid fever, always noticeably rare in these islands, has seemed in the present year to be almost eliminated. Dysentery has decreased, especially where there are improved conditions of garrison life, absence of hard field service, the free supply of ice and distilled water, and enforced abstinence from native fruits and uncooked vegetables. In a general way it may be said that the necessary enforcement of the rigid rules to stamp out cholera has pointed to the proper means for eliminating dysentery also. During the period covered by this report there have been 18 deaths from malaria, or 7.26 per cent of total deaths; nine have died of typhoid fever, or 3.63 per cent of total deaths; while there have been 27 deaths from dysentery, representing 10.89 per cent of the total mortality.

Some of the worst outbreaks of beriberi have been found to originate where the native scouts have been quartered in old, half-decayed buildings. It is without doubt very unwholesome to sleep on the ground, as these natives often do, crowding together closely in old convents or other buildings, where the ground, being mostly damp and unvisited by the sun, gives out exhalations from the silt of past occupation.

Ten native scouts succumbed to beriberi during the past year; there was no death from this cause among the white troops. Out of much obscurity that hangs around this disease, there may be evolved two or three working theories which give good promise toward elimination of the disease: (1) It seems to be peculiarly a native disease; (2) it is found that a generous diet, such as afforded by the full army ration, is useful in promoting a cure, even though it be doubtful whether the rice component has any bearing on the causation of the disease; (3) it seems to be a "place" disease. Numerous instances have occurred where removal of the command has been followed by disappearance of the disease. The main indication, indeed, toward elimination of beriberi appears to be a complete change of locality to a clean, dry, and well-ventilated building.

Active service has obtained in the Department of Mindanao, where there have been many important expeditions and frequent practice marches, with medical officers and hospital corps men accompanying. The cessation of field operations in the Department of the Visayas has resulted in a general state of quiet at most of the posts. In the Department of Luzon very little "hiking" has been performed outside the service of the native scouts.

The hospital buildings at the various posts vary in character according to whether they are rented buildings, had recourse to in emergency, or temporary structures built by the United States Government to tide over a present want, or the buildings of tropical design—i. e., well raised from the soil, lightly built, spacious and airy—pertaining to the posts lately built, supposed to be permanent. Except those last mentioned, the buildings used as hospitals are mostly faulty in construction, location, and arrangement. Many of them are built of nipa and native materials that are short lived, and these have already lapsed into decay. Many of them have no suitable rooms for operative work, laboratory work, or for protecting the necessary supplies. It has been the practice as far as possible to utilize the better adapted hospitals of the new posts as "base hospitals" for the smaller commands, and cases requiring surgical or medical attention are frequently transferred from the outlying posts. The hospitals at Iloilo and Zamboanga serve in this capacity for the Departments of the Visayas and Mindanao, respectively, offering good geographical advantages, and many cases can be treated in these that otherwise would have to be transferred to Manila. The First Reserve Hospital, Manila, and the Convalescent Hospital, Corregidor Island, constitute places of refuge for the more difficult cases of sickness. Most of the important surgical operations are performed at the First Reserve Hospital. Infectious diseases are treated in Hospital No. 4, Manila.

There has been a marked improvement in quarters in some stations, while in many others the former conditions of rented buildings, etc., have continued to make the habitations of officers and soldiers very unsatisfactory. This condition is expected to be relieved in a measure by the construction of the new posts; there are still many of the old makeshifts, however, and it is found that little or nothing will be done for the repair of the buildings of a post while the land is occupied with an uncertain tenure; hence the importance of expediting the perfecting of leases and establishment of titles. The supply of clothing has been satisfactory in character and no marked changes are necessary in this respect.

The dry-earth system is used for the disposal of excreta. The pans, as also the garbage cans, are daily emptied into the sea, or the contents are buried in the earth, or else removed to a distant spot in a favorable location, mixed with garbage, covered with waste straw, coal oil, and other combustible materials, and burned.

Orders require all drinking water to be boiled or distilled; and it is generally distributed in galvanized-iron cans, covered. Many cases of diarrhea and dysentery can be traced to disobedience of orders in this respect.

Satisfactory reports have been received as to the quality and quantity of the food supply and its preparation. The discontinuance of the routine issue of the emergency ration by General Orders, No. 72, Division of the Philippines, series 1903, has further tended to improve the conditions of subsistence of troops. On the other hand, the new scout ration is hardly an advance, inasmuch as it diminishes the bread and rice portions without a sufficient increase of the meat constituents. I would recommend that the scout ration should be made equal to that of the white troops. A good many efforts have been made to increase the scout ration, and General Orders, No. 62, current series, War Department, was supposed to be quite an improvement. It was only a step, however. The scouts are kept hard at work, and are likely to continue to be so used for a long time to come. As one very practical inspector has lately said in one of his careful reports, "If they are expected to do a man's work, they should have a man's full ration." From my own observations, I entirely agree with Major Tutherly's opinion.

The furnishing of ice to organizations of the Army, where rations are issued in kind, has had most satisfactory results. Similarly, the service and supplies of hospitals have been improved by Circular No. 10, War Department, series 1903, authoring the purchase of ice from the fund of 40 cents per diem appropriated for the special diet of enlisted patients in hospitals who are too sick to subsist on the army ration. Also, where the 40-cent fund has proved insufficient, authority has been granted for purchase, from the medical department appropriation, of ice for the use of hospitals. While it is desired to avoid any extravagance in this respect, it is felt that there is no one agent that is productive of so much comfort and improvement of the diet of the sick as a plentiful supply of ice.

The following is an extract from a report submitted by the sanitary inspector, Headquarters Philippines Division: "During the year much work has been done along the quartermaster's water front in making systematic inspections of all transports, launches, lorchas, etc. In this manner four cases of cholera and four of smallpox have been detected and immediately isolated, and the proper cleansing and disinfecting measures instituted. The last case of cholera coming under the attention of this office occurred in September, last; of smallpox, in May, 1904. Owing to the fact that a considerable number of cases of smallpox developed in various quarters of the city about this time, general vaccination of civilian and native employees was begun, and approximately fifteen hundred inoculations made during May and June just past. No further case of smallpox has occurred.

"The two distilling plants operated by the quartermaster's department are doing satisfactory work. The daily capacity is about 10,000 gallons, supplying an ample quantity of good drinking water. Bacteriological examinations have been made at intervals, always with satisfactory result.

"During the year special efforts have been made to inspect all interisland transports on their return to this port from each trip, paying particular attention to the steward's department and the facilities for proper care and transportation of enlisted men. Many of these boats are chartered by the quartermaster's department, consequently there has been considerable difficulty in obtaining the standard of cleanliness to be desired. The quartermaster in charge of water transportation has rendered every assistance: several ships which remained filthy after repeated protests have had their charters withdrawn. The result is that while much improvement can still be made, much has already been accomplished."

PORTO RICO.

Henry Barracks.—The surface drainage is poor. Water from mountain streams pure and abundant. Other sanitary conditions good.

San Juan.—Water supply is sufficient in quantity and of generally good quality. It was recommended that the orders at present in force in regard to boiling all drinking water be continued.

HAWAII.

No unsanitary condition has been reported during the year.

CUBA.

Sanitary conditions generally satisfactory. The last troops were withdrawn from this island in February, 1904.

CHINA.

A severe outbreak of typhoid fever in the command was attributed, the earlier cases to drinking unauthorized water from polluted sources, the later cases to carriage by flies from infected earth closets. Water supply used for drinking and cooking purposes is condensed.

SURGICAL OPERATIONS.

During the calendar year 1903, 3,428 surgical operations were reported by medical officers as having been performed by them on officers and enlisted men of the Army. The following tabulation shows in detail the operation, disease, or injury for which operation was done and the result in each case:

Operation.	Disease or Injury.	Re- cov- ered.	Re- cov- ered.	Re- cov- ered.	Remarks.
Removal of tumors, enucleation...	Angioma 1, chalazion 1, cystic 13, dermoid 1, fibroma 7, gumma 1, lipoma 12, myoma 1, neuro- ma 1, papilloma 1, poly- pus 1, sarcoma 3, seb- aceous 37, seboma 2, not stated 3.	85	85		
Removal of foreign bodies:					
Bullet and shot wounds...	Shot wounds...	71	71		
Miscellaneous operations...		1	1		
Opening of abscesses, etc.	Injury to disease 233	72	233	2	Death from septi- cemia 2
Operations on the eye:					
Excision, disease of appendages...	Trachoma...	34	34		
Iridectomy...	Trachoma, cataract, glau- coma 1	2	2		
Keratotomy...	Keratoma...	1	1		
Excision of cataract...	Cataract 2, cataract 1	2	2		
Curettage...	Cataract...	1	1		
Operations on the ear:					
Operation on the ear...	...	2	2		
Parotidectomy...	...	2	2		
Operations on the nose:					
Rhinoplasty...	Rhinoplasty, cataract, etc.	5	5		Parotid, cataract on cataract...
Removal of nasal polyp...	Nasal polyp, cataract, etc.	2	2		Rhinoplasty, cataract, etc. (see page 1 of report)
Removal of nasal polyp...	...	1	1		
Operations on the mouth:					
Tonsillectomy...	Tonsillectomy, cataract, etc.	2	2		
Removal of tonsil...	...	1	1		

Operation.	Disease or injury.	Cases.	Recovered.	Died.	Remarks.
Operations on arteries, ligation	Shot wound 1, incised wound 2.	3	2	1	Ulnar 1, temporal 1, common carotid, death 1. ^a
Operations, veins: Obliteration	Varicocele	220	220		High 149, open 8, scrotal 4, excision 14, not stated 45.
Do.	Varicose veins	28	28		Ligation 4, excision 11, excision and ligation 7, not stated 6.
Operations on nerves: Excision	Shot wound	1	1		Part of saphenous.
Incision	Contusion	1	1		Adhesion of spiral.
Operations on respiratory organs: Tracheotomy	Self-inflated incised wound.	1		1	Died within 8 hours of hemorrhage.
Thoracentesis	Beri-beri 1, pleurisy 13, pneumonia 4, empyema 5, pulmonary abscess 1, hepatic abscess 2, incised wound 1.	27	20	7	Death beri-beri 1, septicemia 1, empyema 1, pneumonia 1, pleurisy 1, hepatic abscess 2.
Operations on digestive organs: Dilatation	Esophageal stricture	2	2		Burn by lye in childhood.
Gastrorrhaphy	Incised wound stomach	1			
Laparotomy	Shot wound 3, cholelithiasis 1, intestinal obstruction 2.	6		6	Death, shot wound 3, cholelithiasis 1, intestinal obstruction 2.
Colostomy	Peritonitis	1			
Appendectomy	Appendicitis	106	100	6	Death, peritonitis 4, tuberculosis of intestines 1, tuberculosis 1.
Cholecystotomy	Cholelithiasis		1		
Herniotomy	Inguinal 148, ventral 8, umbilical 2, femoral 1.	159	158		Death from tetanus after operation for ventral hernia.
Paracentesis	Dysentery, ascites				
Coccygectomy	Carcinoma				
Incision and drainage	Ischio-rectal abscess 36, hepatic abscess 16, fistula in ano 48, rectal ulcer 16, fissure of anus 5.	121	115		Death, hepatic abscess 6.
Aspiration	Hepatic abscess	5	4	1	
Closure of sinus	Hepatic abscess	1	1		
Obliteration	Hemorrhoids, internal 68, external 139, mixed 37.	244	241		Excision 53, ligation 29, excision and ligation 14, clamping 79, not stated 69.
Operations on lymphatic organs: Incision and extirpation.	Adenitis, venereal 543, non-venereal 91, traumatic 15.	649	649		
Operations on urinary organs: Urethrotomy	Venereal 16, nonvenereal 4.	20	20		External 3, internal 17.
Nephrotomy	Urinary calculus	3	3		
Lithotomy	Vesical calculus	1			
Nephropexy	Displaced kidney	1			
Incision	Urethral fistula 3, perinephritic abscess 1, rupture of bladder 1.	5			Death, rupture of bladder, peritonitis.
Operations on generative organs: Circumcision	Venereal 124, nonvenereal 373.	497	497		
Amputation penis	Chancroid	1	1		
Castration	Traumatic orchitis 1, varicocele 1, tuberculosis 1, hydrocele 1.	4	4		Left testicle 4.
Incision	Orchitis 3.	3	3		
Closure of fistula	Perineal fistula, gonorrheal.	1	1		Tract opened.
Obliteration	Hydrocele, injury 3, disease 34.	37	37		Tapping 12, excision 12, incision 5, injection 2, not stated 6.

^a Stab wound neck, aneurism, attempt to ligate common carotid artery and internal jugular vein.

Operation.	Disease or injury.	Cases.	Recovered.	Died.	Remarks.
Operations on bones:					
Trephining.....	Fracture skull 4, osteomyelitis femur 1.	5	3	2	Death, cerebral hemorrhage 2.
Excision.....	Shot wound, humerus 1, rib 1, femur 1.	3	2	1	Death, shock shot wound femur.
Laminectomy.....	Fracture spine.....	1	1		
Removal of portions.....	Injury 27, disease 11.....	38	38		Necrosed 25, fractured fragments 7, exostosis 6.
Union of bone.....	Injury.....	13	13		Wired 9, coaptated 4.
Incision.....	Periostitis 5, osteomyelitis 1.	6	6		
Operations on joints:					
Reduction of dislocations.....	Injury.....	26	26		Shoulder 20, elbow 4, hip 1, knee 1.
Forcible motion.....	Ankylosis.....	3	3		Knee joint 2, elbow joint 1.
Incision.....	Arthritis.....	4	4		Wrist 1, knee 2, ankle 1.
Aspiration.....	Injury 3, synovitis 5.....	8	8		Knee joint.
On cartilage.....	Injury 2, disease 5.....	7	7		Removed 6, anchored 1.
Operations on limbs, amputation:					
Shoulder joint.....	Shot wound 1, bolo wound 1.	2	2		Primary 1, secondary 1.
Arm.....	Shot wound 3, campilan 1, kris 1.	5	5		Primary 4, secondary 1.
Forearm.....	Shot wound.....	1	1		Primary.
Part of hand.....	Shot wound.....	1		1	Death, tetanus.
Fingers.....	Shot wound 13, other injury 33, disease 8.	54	54		
Hip joint.....	Traumatic osteomyelitis.....	1	1		
Thigh.....	Shot wound 2, injury 3.....	5	4	1	Primary 2, secondary 3, death, shot wound, hemorrhage.
Leg.....	Injury.....	3	3		Primary 2, secondary 1.
Toes.....	Shot wound 1, injury 4, deformity 8.	13	13		
Operations on muscles, fascia, and tendons:					
Tenotomy.....	Injury 3, disease 4.....	7	7		
Myotomy.....	Injury 1, disease 6.....	7	7		
On appendages.....	Injury 1, disease 7.....	8	8		
Operations on skin etc.:					
Closure of wounds.....	Shot wounds 2, incised 5.....	7	7		
Removal, nails.....	Ingrowing nails.....	223	223		
Removal, skin.....	Keloids 3, shot wound 1.....	4	3	1	Death, acute gangrene following shot wound.
Incision.....	Cellulitis 27, carbuncle 27, furuncle 289, whitlow 26.	369	368	1	Death, multiple carbuncle.
		3,428	3,385	43	

NOTE.—A number of operations not included in the above table were performed on discharged soldiers, general prisoners, employees of the Quartermaster's Department, and other civilians admitted to army hospitals for treatment. Among these operations were 5 excisions of the eyeball, 1 extraction of catenact, 1 ligation of tibial artery, 1 ligation of brachial artery, 8 for varicocele, 1 tracheotomy, 5 thoracentesis, 18 herniotomy, 11 appendectomy, 5 laparotomy, 2 lithotomy, 2 urethrotomy, 1 prostaticotomy, 31 circumcisions, 10 for hydrocele, 1 amputation penis, 1 castration, 4 trephining, 7 removal of bone, 1 amputation shoulder joint, 2 amputation of arm, 2 amputation of thigh, 10 amputation of leg, 1 amputation of foot, and 15 amputation of fingers and toes.

NOTE.—Number of surgical operations on soldiers reported 3,428, of which 386 were necessitated by injury and 3,042 by disease.

From the interesting report on the surgery of old men by Maj. William H. Arthur, surgeon, U. S. Army, attending surgeon, United States Soldiers' Home, Washington, D. C., the following extracts were taken:

The hospital of the United States Soldiers' Home offers unusual opportunity for observing the effect of old age, with its accompanying disabilities, in reducing the chances of recovery from serious surgical operations, involving prolonged anesthesia;

and during my service here of about ten months I have been greatly impressed with the fact that old men are much better subjects than, I believe, is generally supposed.

Some of the inmates are veterans of the Mexican war; many of them were mature men at the outbreak of the civil war, and most of the younger men are the débris of the Spanish war and the military operations in the Philippines. This clientele does not seem to offer a very promising field for surgery. Many of these men suffer from chronic alcoholism, general arterio-sclerosis very far advanced, chronic nephritis, cystitis, tabes, diabetes, syphilis, or inoperable visceral cancer. Heart diseases (including neuroses, valvular defects, and degenerations of the heart muscle) and chronic pulmonary tuberculosis, extensive emphysema, and chronic bronchitis are very common. Indeed, it is the exception to find a man over 60 in the hospital entirely free from one or other of these diseases, and still many of them present indications for operation almost mandatory, if what is left of their lives is not to be intolerable.

Out of 65 operations I have performed here, of sufficient severity to require general anesthesia, 22 were done on patients averaging 70.4 years of age (the youngest being 62, the oldest 85) and, as it is these cases only that present anything of interest in this connection, the others will not be considered.

The operations in the 22 cases under consideration comprised:

	Operations.	Recovered.	Died.
Amputation	4	3	1
Hernia, inguinal	8	8	0
Hemorrhoids	3	3	0
Exploratory laparotomy	2	2	0
Ventral hernia	1	1	0
Lithotomy (supra pubic)	1	1	0
Trephining and removal of depressed bone of skull	1	1	0
Varicose veins	1	1	0
Nephrectomy	1	1	0

The one case among the 22 that ended fatally (this man died on the fifth day after the operation) was a case of amputation 2 inches below trochanter for senile gangrene of lower extremity. There was no oozing from the flaps, the femoral arteries were obliterated, no attempt at union resulted, and the stump became gangrenous. This man had three years before lost the other lower extremity (amputation at about the same point) for the same cause. He was 69 years of age and in general poor condition. The operation was done at the patient's earnest solicitation to relieve intolerable suffering in the extremity.

The only conclusion to be drawn from these cases is that we need not hesitate to operate even on very old men; that their chances are rather better than is generally supposed, and that in view of the record of the anesthetist at this hospital, who has been administering the anesthetics for fourteen years without a death (586 cases in all), it would appear that general anesthesia is not so dangerous for old people as we are led to believe.

In an interesting paper, discussing at length results of surgery in the Philippine Islands, Maj. J. M. Banister, surgeon, U. S. Army, in conclusion presents the following propositions:

1. Aseptic results will just as surely follow aseptic methods in the Philippines as in the United States or Europe.
2. Should septic infection occur in any clean case subjected to operation in the Philippines, blame the technique, not the climate.
3. Successful attainment of the object for which the operation has been undertaken will follow careful and skillful surgery in the Philippines with the same regularity that we have been accustomed to observe in such work at home.
4. Convalescence after surgical operations in the Philippines is rapid and satisfactory when such operations have been carefully and skillfully performed.
5. The danger of mortality after a skillfully performed surgical operation in which

all the details of a rigid aseptic technique have been carried out is not increased by the influences of the climate of the Philippines unless the patient is at the same time the victim of some other serious disease.

INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY.

Maj. Walter D. McCaw, surgeon, U. S. Army, who attended the Eleventh International Congress of Hygiene and Demography in session at Brussels, September 2 to 8, 1903, rendered the following interesting report on the proceedings of the congress:

The opening session of the congress took place next day in the Palais des Academies, His Royal Highness Prince Albert of Belgium acting as honorary president. In the afternoon the various sections of congress assembled for work. Two grand divisions were organized—the division of hygiene and that of demography. The division of hygiene which met in the Palais de la Nation was subdivided into seven sections as follows:

- I. Bacteriology, microbiology, and parasitology applied to hygiene.
- II. Hygiene of alimentation. Chemical and veterinary sciences applied to hygiene.
- III. Technology. Hygienic engineering and architecture.
- IV. Industrial and professional hygiene.
- V. Hygiene of public transportation.
- VI. Administrative hygiene. Prevention of transmissible diseases. Dwellings of the working class. Hygiene of infancy.
- VII. Colonial hygiene.

As it was entirely impossible to attend more than one section, I confined my attendance to the section on colonial hygiene with the exception of one day when I attended the third section to listen to a very valuable paper by Mr. Fowler, of Manchester, England, on the bacterial purification of sewage exemplified by the city system of Manchester.

By far the greater part of the papers had been printed prior to the meeting of the congress and issued in the form of leaflets to the different members. It was therefore an easy matter to follow the discussion of the various questions intelligently. A journal of the congress was issued daily giving briefly the main points of the various discussions. The third section after listening to the papers of Fowler, of Manchester; Dunbar, of Hamburg; Launay, of Paris; Rideal, of London, and others set the seal of its approval upon the bacterial method of purifying sewage as being both economical and hygienic, practicable and effective.

The section on colonial hygiene held a long discussion on the subject of proper diet for the Tropics, the final outcome of which was a decision that moderation in eating and a liberal and varied diet were advisable for Europeans in the Tropics, but did not recommend any very defined change from the accustomed diet in temperate climates. The opinion of the section on this point seems to be entirely in accord with the experience of the United States army in the Philippine Islands.

Doctor Celli, of Rome, made a report upon the prophylaxis of malaria and stated that excellent results had been obtained by the free distribution of quinine to the poorer classes. Sir Patrick Manson stated that he did not believe mosquitoes to be the sole cause of the disease, but that some other factor, evidently as yet unknown, existed. He laid great stress upon the necessity of examining all candidates for service in tropical climates as to their ability to take quinine, and believed that no persons who from special idiosyncrasy were unable to bear quinine should be so employed. The prophylaxis of malaria, it was decided, should be under three headings: (1) The destruction of mosquitoes and of their larvae; (2) the protection of the individual by mosquito bars; (3) and most important, the segregation of Europeans from the native villages at a safe distance. The specific remedies for malaria are quinine and small doses of arsenic. The section universally congratulated the Italian Government for the measures taken in the fight against malaria.

The discussion on the prevention of bubonic plague developed nothing of especial interest.

The sleeping sickness of Africa was discussed by Doctor Van Campenhout, from the Congo, who proposed the following conclusions: (1) Isolate as soon as possible individuals attacked by the sleeping sickness; (2) to not permit their transportation by public carriage—land or water; (3) not to send to their own countries individuals attacked while absent therefrom. Sir Patrick Manson stated that the cause of this sickness is still unknown, but believes that the trypanosoma is the cause. Doctor

Blanchard described a French mission to Africa and confirmed Doctor Manson's belief as to the cause of the sleeping sickness.

The prophylaxis of beriberi was then taken up by the section. Much difference of opinion was expressed as to the cause of this disease, such as monotonous diet, the use of alcohol, infection of dysentery, typhoid fever, etc. No final conclusions on this point were made, but the following resolution was adopted:

"In the absence of positive and sufficient knowledge on the origin of different varieties of beriberi, a more complete study of this affection is necessary. While waiting the definite result of further research, it is necessary to apply strictly to native populations the rules of hygiene concerning alimentation and dwelling places which have been found of value by colonial physicians."

A discussion on vaccination and the preservation of the virus in the Tropics then followed. Doctor Guérin stated that the virus should not be mixed with too much glycerin and should not be triturated when it was necessary to transport it some distance. He stated that the rabbit was an excellent vaccinator. Doctor Calmette suggested that monkeys could be inoculated with variola, and after several passages the rabbit could be inoculated, and if the latter showed pustules the material might be authorized as vaccine.

The final question before the section was on the question of instruction in colonial medicine, the necessity of which was unanimously acknowledged.

The congress closed by a formal session on the 8th of September. Professor Harrington, of Harvard, invited the congress to meet in Washington in 1909. This invitation was issued after consultation with the United States minister to Belgium, who had received from the Secretary of State an intimation that the meeting of the congress in the United States in that year would be agreeable to the Government, this invitation subject to future formal action by the Government of the United States. The place of meeting for the next congress in 1907 will be Berlin.

NUTRITION INVESTIGATION.

A very interesting nutrition investigation was conducted upon a detachment of the hospital corps, at New Haven, Conn., under the direction of Prof. R. H. Chittenden, director of the Sheffield Scientific School, extending over the period from September 28, 1903, to April 1, 1904.

The detachment, consisting of one sergeant first class, one sergeant, one corporal, one private first class, and fourteen privates, was under the command of Lieut. Wallace DeWitt, assistant surgeon, U. S. Army. The following are extracts from his report:

The object of the experiment was to determine the minimum proteid food requirement necessary to maintain health, and the effect of such a minimum of proteid upon the human organism as regards muscular strength and the ability to do work, both mental and physical.

Since many of the excrementitious substances of the body were due to the products of nitrogenous metabolism, it was Prof. Chittenden's desire to lower to a minimum, consistent with health, the nitrogenous food, and in this way bring less work upon the organs or tissues concerned in their excretion. It was his opinion that proteid foods were, as a rule, taken in excess, and that the resulting excess of waste products must in the long run have a deleterious effect upon the organism. As an example of this he cited the increase of arterio-sclerosis among Americans.

Since food rich in proteids is the most expensive of foodstuffs, a proof that such food could be advantageously reduced, founded on experimental evidence, would be of great economic value.

His method of conducting the experiment would be something as follows: On arrival of the detachment of Hospital Corps at New Haven, the men would live for the first ten days on the food to which they were accustomed since entering the service. After this period there would be a gradual reduction in the quality and quantity of the food, especial attention being paid to the proteid components. This reduction would be very gradual in order to accustom the men to the change, and so far as possible it would be a reduction in quality rather than quantity, the bulk being kept up by a substitution with articles of small food value, such as cabbage, etc., thereby giving a feeling of satisfaction after meals. The quantity of the food taken by each man would be determined at each meal. All urine and feces would be collected, and by examination of these an index would be obtained to metabolism in

general and proteid metabolism in particular. The men themselves would be weighed each morning, and subjected to certain daily work in the gymnasium under an instructor who would from time to time make certain strength tests and measurements. So far as practicable the men would perform the regular duty of enlisted men of the Hospital Corps.

On October 1, 1903, the detachment having become comfortably settled, the men were put upon the diet prescribed by Professor Chittenden, for which purpose a bill of fare was furnished by him at the beginning of each week. For the first ten days the food compared favorably with that obtaining in a well-conducted Hospital Corps mess, with the addition of a few extra articles such as lettuce, butter, etc., and the men were permitted to eat as much as they desired. At the end of this period what may be called the "cutting-down process" was commenced, during which time the amount and quality of the food was gradually reduced, especial attention being paid to the proteid components (first meat and then vegetables of high proteid composition). To make up for the loss in bulk, carbohydrates and vegetables of low proteid composition were substituted as far as possible. The food allowed to each man was limited to the weight on the bill of fare furnished by Professor Chittenden, and the actual quantity consumed was carefully estimated by weighing, and the amount recorded on a blank form furnished by the authorities conducting the investigation. All of this weighing was done by a noncommissioned officer detailed for the purpose. The cutting-down process referred to was continued until about December 20, 1903, at which time it was decided that the desired minimum had been obtained, and from this time until the end of the investigation the food was kept of approximately the same quantity and composition.

During the entire period of the investigation all urine and feces were collected in individual bottles and cans provided for the purpose and sent to the laboratory for examination at the end of each twenty-four hours, after being weighed and measured by a noncommissioned officer. When not in use these receptacles were kept in individual lockers, for one of which each man had a key, in this way avoiding any accidental admixture of urine from different men. The men were sent to the gymnasium each morning, where they were given work under a gymnastic instructor appointed by Professor Chittenden. This work consisted of the use of chest weights, horizontal bars, jumping, running, rowing, etc., the procedure being varied day by day to prevent "staleness." Certain strength tests and measurements were taken at the gymnasium from time to time, and once a week certain body measurements were made at the detachment quarters.

Very important results have been obtained as a result of the investigation, which will be published by Professor Chittenden in his forthcoming book.

UNITED STATES ARMY GENERAL HOSPITALS.

UNITED STATES ARMY GENERAL HOSPITAL, PRESIDIO OF SAN FRANCISCO, CAL.

This hospital has undergone a number of improvements during the year. The following structures have been erected and occupied since the last annual report: Operating pavilion, dressing rooms, one each for wards D and E; a large storeroom; dormitory with an annex for the detachment of the hospital corps, addition to the morgue, guard-house, and kitchen for the officers' ward.

The number of cases treated per year has continued to decrease.

The following table shows the admission and disposition of the sick during the year ending December 31, 1903:

	From Phil- ippine Islands.	From points in United States.	Total.
Remaining in hospital Jan. 1, 1903.....	301	68	369
Total admissions during year.....	1,314	840	2,154
For gunshot wounds.....	17	12	29
For diarrhea and dysentery.....	525	114	639
For malarial fevers.....	68	38	106
For typhoid fever.....	13	9	22
For rheumatic affections.....	57	25	82
For venereal diseases.....	65	90	155
For alcoholism.....	4	10	14
For injuries.....	50	98	148
For insanity.....	64	7	71
For other causes.....	451	437	888
Total returned to duty.....	539	659	1,198
Total discharged for disability.....	269	82	351
Deaths from all causes.....	28	16	44
Desertions.....	16	7	23
Sent to Government Hospital for the Insane.....	41	5	46
Sent to United States Army general hospital, Fort Bayard, N. Mex.....	61	28	89
Sent to Army and Navy general hospital, Hot Springs, Ark.....	42	9	51
Otherwise disposed of.....	226	224	450
Remaining in hospital Dec. 31, 1903.....	160	111	271

During the year there occurred an epidemic of measles which proved most fatal in its results, and from which cause there occurred 10 deaths, which in each case was due to development of abscesses in both lungs and pleural cavities. This epidemic was succeeded by one of mumps. Erysipelas became epidemic at one time, and it was necessary to remove all cases from the surgical wards after which there was no further occurrence of this disease.

During the year 211 operations were performed. Of this number there were 7 amputations, 21 appendectomies with 1 death, 12 cases of liver abscess with 6 deaths, and 26 herniotomies with no death.

The following table gives a summary of the work done in the eye, ear, nose, and throat department:

Total number of cases treated.....	737
Diseases of the eye.....	341
Diseases of the ear.....	146
Diseases of the nose and throat.....	250
Total number of operations.....	130
On the eye.....	48
On the ear.....	8
On the nose and throat.....	74

In the X-ray laboratory a new coil machine of the most improved pattern has been installed and excellent results are reported from its use. Radiographs of various portions of the body can be taken with exposures varying from a few seconds to one and a half minutes—a short enough time for all practical purposes. Excellent pictures of the chest have been taken in one minute, showing distinctly tubercular nodules, pleural thickening, and even abscess cavities with their surrounding walls. In addition to diagnostic work, the following therapeutic work has been done with the machine:

Ringworm of the face cured in three exposures after all medication failed.

One keloid of neck in a little girl 6 years of age, following burn; very much improved and still under treatment.

One lupus of the face cured after having been operated upon several times.

One mastitis, chronic; cured.

Ten cases of chronic eczema cured.

One case of chronic gonorrheal rheumatism of the ankle was very much improved after all other treatment failed.

One case of chronic rheumatism of knee was very much improved after failure of other treatment.

One case tubercular glands of neck, very extensive, not improved.

In the pathological laboratory the following routine work was done besides original investigations: Examinations of blood, 2,496; examinations of urine, 3,588; examinations of feces, 1,386; examinations of sputa, 963; blood counts, 496; Widal's test, 47; Malta fever tests, 13; cultures for diphtheria, 16; post-mortems, 42; sections of post-mortem material, 508; miscellaneous, 221.

In addition to the examinations given above, there were 610 examinations from outside sources, comprising the substations of the Presidio, stations of the Department of California and from department headquarters. These examinations were divided as follows: Examinations of blood, 178; examinations of urine, 299; examinations of sputa, 37; examinations of feces, 51; and miscellaneous, including water analyses, etc., 45.

As a result of the blood examinations the pathologist makes the following remarks concerning the decline of malarial cases:

In the last annual report of the laboratory I mentioned the decline in the number of malarial cases received at this hospital, this decline being out of proportion to the total number of examinations made. The following table will illustrate how, from year to year, the number of cases of malaria observed has decreased:

	Total blood examina- tions.	Total mala- rial infec- tions.
Oct. 4, 1899, to July 1, 1900	2,467	264
July 1, 1900, to June 30, 1901	5,815	643
June 30, 1901, to May 31, 1902	3,518	175
May 31, 1902, to June 30, 1903	3,413	158
June 30, 1903, to June 1, 1904	2,073	57

A consideration of this table will show at once that malaria is not as prevalent in soldiers returning from the Philippines as it was in 1899, 1900, and 1901. This decrease is undoubtedly due to a better understanding of the mode of spread of this disease, and also to the fact that the troops are better housed and largely in permanent posts, thus not being exposed to infection.

The examination of feces gave the following interesting results: Of the 1,386 specimens examined microscopically for intestinal parasites the ameba coli was found in 201; trichomonas intestinalis in 203; cercomonas intestinalis in 29; uncinaria (ankylostoma) in 10; teniæ in 12; strongiloides intestinalis in 6; ascaris lumbricoides in 38, and trichuris trichuria in 196.

UNITED STATES ARMY GENERAL HOSPITAL, FORT BAYARD, N. MEX.

The commanding officer rendered the following report on the operations of the hospital for the year:

Since January 1, 1903, the following additions, etc., have been made to this hospital: A new officers' infirmary, an addition to the enlisted men's infirmary, a

morgue, receiving vault, crematory, laboratory, quartermaster and medical storehouses, hospital corps barracks, cold-storage plant, and an electric-lighting plant. Some are completed, but most of them are under construction or in process of installation.

Sleeping out of doors is encouraged and, in some cases, ordered. For this, tents framed and floored are used, as also the porches. The porches are protected on the windward side by glass. The solarium completed last March has been of great advantage to the patients.

Every effort has been made to make life as pleasant as possible. A stage with scenery, billiard and pool tables, an Angelus and all sorts of games have been provided. Wagon transportation for recreation has been furnished as freely as means have allowed.

The danger of carrying infection has been thoroughly understood, and each patient is provided with a spit cup upon his arrival at the station.

The following new buildings are needed, viz: Officers' quarters, dining rooms for the officers and enlisted men's infirmaries, wards for ambulant patients, chapel, quarters for sergeants first class, hospital corps, administration building, and a special hospital for sick noncommissioned staff officers of both Army and Navy.

Treatment.—The treatment is simply hygienic and climatic, with the treatment of intercurrent complications as they arise. All patients are required to remain out of doors during the day except those confined to the infirmary. In inclement weather they spend the time in the solarium, where they are sheltered and at the same time have the benefit of the sunlight.

The patients, for purposes of treatment, are divided into four classes: (1) Convalescent, ambulant patients. These men require little or no special treatment. They are quartered in the wards and report at sick call at 9 a. m. each morning whenever the progress of their cases requires special attention. (2) Febrile ambulant cases. These cases are taken from those of the first class or are assigned to this class for treatment at the time of admission to the hospital. Cases of the first class who are shown by the weekly weight records to be losing are assigned to this class, as are also those who have fever. These patients are quartered in tents. They are under special supervision as regards their diet and manner of life. They are required to take three hours rest in bed each day, one hour and a half in the morning and one hour and a half in the afternoon. They are required to retire at 9 p. m. Careful record of these cases is kept and any change for the better or worse noted. It has been found that the enforced rest, constant out of door life, and attention to minor details of treatment in this class of cases results in the great majority of instances in a quick and decided gain. This treatment is also a decided benefit to the patient in that it trains him, as can be done in no other way, to the understanding and observance of the regular hours and fundamental laws of health, without which it is impossible to achieve the best results in the treatment of pulmonary tuberculosis. (3) The third class of patients are the uncomplicated, but far advanced cases. These are assigned to quarters in ward one, a building situated near the infirmary and removed from the larger wards, thus allowing these patients greater quiet and more seclusion than could be obtained in one of the larger wards. These patients mess at the infirmary, where they are able to procure special articles of diet and are not obliged to go a great distance from their quarters. (4) The fourth class of patients are those who are either confined to bed or whose cases require constant supervision. They are quartered at the infirmary. It has been found desirable to keep a certain number of this class constantly out of doors. For them tents have been pitched at a short distance from the building. These patients are subject to the same supervision as the tent patients of class two. In addition they are constantly near the hospital and have the advantage of special diet and treatment that the condition of each individual may demand.

STATISTICAL REPORT.

During the year 1903 the total number of cases treated at the Fort Bayard General Hospital was 644. Of these, 204 were present at the beginning of the year and 257 remained at its close.

The patients treated were classified as follows: (1) Cases exhibiting permanent afebrility without tubercle bacilli in the sputum, 95. (2) Cases exhibiting permanent afebrility or approximately permanent afebrility with tubercle bacilli in the sputum (pure tuberculosis of a minor degree of mixed infection), 235. (3) Cases exhibiting permanent febrility with tubercle bacilli (mixed infection), 304. To this must be added a fourth class. (4) Cases exhibiting permanent or approximate febrility without tubercle bacilli in the sputum, 9.

The results obtained in the 643 cases reported on are classified as follows: (1) Arrested cases, those in which all outward symptoms of the disease have disappeared. (2) Improved cases, those not arrested but in which the lesion is less than at the initial examination. (3) Unimproved cases. (4) Deaths.

The following table gives the results obtained in each class of cases, with the results of all classes combined:

	Arrested.		Improved.		Unimproved.		Died.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Class 1 (95 cases).....	18	18.95	73	76.84	4	4.21	None	
Class 2 (235 cases).....	4	1.7	168	71.48	59	25.1	4	1.7
Class 3 (304 cases).....	None		96	31.57	142	46.71	66	21.71
Class 4 (9 cases).....	None		3	33.33	3	33.33	3	33.33
Total (643 cases).....	22	3.42	340	52.88	208	32.34	73	11.36

The following table shows the complications associated with the pulmonary lesions. In this table cavities are listed in cases where the physical signs give unmistakable evidence of their presence. It will be seen that they are present, showing a far advanced lesion, in 25 of the cases of Class No. 2 (afebrile cases).

Complications.	Class 1.	Class 2.	Class 3.	Total.
Pleurisy with effusion.....	4	5	24	33
Empyema.....	1	1	3	5
Cavities.....		26	63	79
Hemorrhages.....	1	2	7	10
Dilatation, heart.....	1	1	1	3
Mitral insufficiency.....	2		3	5
Tricuspid insufficiency.....			1	1
Hypertrophied heart.....			2	2
Chronic parenchymatous nephritis.....	3	1	11	15
Chronic interstitial nephritis.....			1	1
Pneumonia.....	1		1	2
Syphilis.....	2	1	1	4
Laryngeal tuberculosis.....	1	1	6	8
Tubercular synovitis, knee-joint.....	1			1
Tubercular prostatitis.....	1		1	2
Dysentery.....		2		2
Chronic articular rheumatism.....			1	1
Fistula in ano.....	1			1
Ischio-rectal abscess.....		1		1
Caries of spine.....	2			2
Alcoholism.....			1	1
Hemiplegia.....		1		1
Pulmonary stenosis.....			1	1
Abscesses.....	1			1
Aortic stenosis.....		1		1

Table of deaths, showing the length of time after admission for each case

Weeks	Months	Average
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		
Class 1.....		1.5 months (45 days)
Class 2.....		1.5 months (45 days)
Class 3.....		1.5 months

Total for first month 1.5 months (45 days)

It will be seen from this table that the lesions which occur are mostly during the first few months of stay in the hospital, or among the cases which are so far advanced that they are in a few months to the stage of recovery. Cases in which advanced cases have only a few months to live, with constant attention to the ordinary rules of hygiene, have life prolonged for an indefinite period.

The first lesion in the fourth class of cases, those in which tubercle would

The spray method of inoculation is most effective. The animal is confined in a closed cage. The ones used in this case were 3 feet long by 2½ feet wide and 2 feet high. The material used is suspended in water, in proportion of 1 to 8. Two ounces of this mixture are strained through cotton and placed in an ordinary atomizer. This is attached to a compressed-air tank, and the spray thrown into the cage. The air pressure of the tank is so regulated that five minutes is required to spray 2 ounces of the mixture.

In order to demonstrate the effectiveness of this method, two control animals were treated. A mixture of tuberculous sputum was used in the proportion of 8 c. c. to 64. The first of these animals was given seven sprayings on seven consecutive days. It died on the fifteenth day after the last spraying. Its lungs were almost completely solidified. The stained sections showed innumerable tubercle bacilli. The spleen was filled with small tubercles and also showed an immense number of tubercle bacilli.

The second animal was given but one spraying of five minutes duration. It was killed on the eighteenth day. Its lungs showed well-defined, isolated tubercles, which when stained showed great numbers of bacilli.

Twelve animals were treated by this method with sediment from the surface of the sewage farm, which had been exposed for two weeks. Each of these animals was given five sprayings of five minutes duration on five successive days. The material used, like other materials from this source, showed tubercle bacilli present in small numbers. These animals were killed one month from the time of inoculation, and in no case showed any evidence of tuberculous infection.

Samples of material deposited upon the banks of the creek, below the farm and above the town of Central, were collected and examined for tubercle bacilli. Over 100 specimens taken from various points were examined. In none of them were tubercle bacilli found.

Forty animals were injected intraperitoneally with a mixture of this material in distilled water. The proportion was 1 to 8 and 2 c. c. were used in each case. Of these 40 animals but 1 died of septic peritonitis. This is interesting as tending to show that little or none of the material from the surface of the sewage farm, containing the associated germs that had caused the death of the animals of the first series, had been carried into the stream or that if present its virulence had been lost. Of the remaining 39 animals of this series, 29 died between the twenty-fifth and thirtieth day after inoculation from an epidemic of a disease similar to cholera. This disease is one quickly fatal for guinea pigs. The animals die in from twelve hours to four days. The examinations of the bodies show hemorrhages into the intestines and stomach with erosions and ulcerations. Cultures taken from these animals showed a slightly motile rapidly liquifying bacillus, similar in appearance to the typhoid, which may be the cause of the disease. None of these animals showed any signs of tuberculous infection on autopsy. The remaining animals were killed at the end of one month. They were carefully examined and showed no signs of tuberculous infection.

The results of these experiments show: (1) That notwithstanding the fact that all sputum from the post is burned in the crematories, the sewage of the place contains tubercle bacilli in very large numbers. (2) That these are deposited upon the surface of the sewage farm in a state of practically unimpaired virulence. (3) That after exposure for two weeks to drying and sunlight their virulence is in a great measure lost or that few bacilli remain capable of carrying infection. That under favorable circumstances this dried material is capable of giving infection. That inhalation of the germs so exposed is not apt to cause infection of susceptible animals. (4) That debris lodged upon the banks of the stream below the farm is practically free from infectious material of the farm. Tubercle bacilli are either absent or if present in such small numbers that they can not be regarded as probable source of infection.

It can not be conceived that there will ever again be any serious question as to the necessity of reporting to health authorities cases of tuberculosis or the propriety of legally authorizing oversight of these cases.

In several municipalities of this country this disease has been classed in the list of communicable and reportable diseases and regulations for its surveillance have been adopted.

The patients discharged from this hospital act as missionaries in the education of the general public in the all-important knowledge of hygienic mode of life and protective measures so practically learned.

UNITED STATES ARMY GENERAL HOSPITAL, WASHINGTON BARRACKS, D. C.

This hospital also served as a post hospital for Washington Barracks during the past year. All hospital and company buildings are in poor repair, and while the sanitary conditions are fair, they are entirely inadequate for their purposes. As the work of excavation and construction for the new engineer post and War College progresses more and more encroachment is made on the hospital grounds and the hospital becomes more and more unsuitable for continued occupancy. The necessity for a new general hospital site and buildings is therefore more urgent now than ever before.

During the fiscal year 529 cases were treated in this hospital, of which 265 were medical, 119 venereal, and 145 surgical. In the surgical service 65 of the more important operations were performed, including 22 operations for hernia of various kinds and 10 appendectomies. Besides the death from a complication developing in a case of hernia after operation, 2 were recorded from croupous pneumonia, and 1 each from carcinoma of tongue; osteosarcoma, right hip joint; renal cirrhosis; carcinoma of rectum and accidental poisoning by wood alcohol.

I repeat most earnestly my previous recommendation that a hospital of sufficient size and perfect in every respect be built in the District of Columbia for the following purposes:

First. Treatment of cases needing the services of specialists, surgical or other observation, and treatment of officers incapacitated for service prior to their appearance before retiring or examining boards.

Second. Training enlisted men of the hospital corps in nursing and military duties.

Third. Instruction at the Army Medical School in military surgery, hospital administration, hospital corps drill, and establishment of field hospitals.

Fourth. To serve as a nucleus around which, in time of war, temporary wards may be erected without delay to any extent and at minimum expense.

Sketch plans have been completed for such a hospital, the establishment of which means so much to the Medical Department and the Army at large.

ARMY AND NAVY GENERAL HOSPITAL, HOT SPRINGS, ARK.

Many minor improvements and all necessary repairs were made to this hospital during the year in which 565 patients were treated for the period June 1, 1903, to June 1, 1904, compared with 372 cases admitted in the calendar year 1902, and 407 in 1901. There were 41 officers admitted and treated during the year. The total number of admissions were classified as follows: Rheumatism in various forms, 270; diseases of digestive system, 39; of the nervous system, 39; malarial fevers, cachexia, etc., 18; of the kidneys, 18; other diseases, 181. Of these cases, 391 were returned to duty or returned to their homes, 7 died, 60 were discharged for disability, 17 were otherwise disposed of, and 90 remained under treatment June 1, 1904.

FIRST RESERVE HOSPITAL, MANILA, P. I.

The following improvements in the buildings have been made during the past year: Lavatories have been constructed at the rear of each

ward, consisting of stationary basins with proper plumbing. The operating rooms have been retiled and repainted and additional apparatus for surgical work has been secured. A new chemical laboratory has been constructed and equipped. A very complete water-distilling plant has been installed, which furnishes all of the drinking and cooking water for the hospital. The kitchen has been improved and rearranged and a most complete steam-cooking plant received from the United States has been installed. A gasoline engine furnishes the power for a dough mixer, ice-cream freezer, hash machine, knife grinder, etc. The commanding officer has arranged a gymnasium for members of the hospital corps detachment, and has secured, by the authority of the chief surgeon of the division, an outfit for the same. This seems to have contributed materially to the well-being of the men. At present the hospital is being repaired and repainted by the quartermaster's department.

A medical department steam laundry which was established for the purpose of laundering the linen for the hospitals in and about Manila has been highly successful. Not only has it removed the danger of infection when the work was done by private parties, but has reduced the cost to the Government for laundering this linen from $2\frac{1}{4}$ cents per piece to four-fifths of 1 cent. It is anticipated that in the near future the receipts from private work will pay all the running expenses of the plant.

The movement of sick in this hospital June 1, 1903, to May 31, 1904, was as follows: Number of cases in hospital June 1, 1903, 282; cases received, 2,530; returned to duty, 1,619; died, 44; transferred to other hospitals, 431; transferred to the United States, 590; discharged, 13; otherwise disposed of, 7; remaining in hospital May 31, 1904, 108.

For the strictly medical work of the hospital 5 wards are available, namely, 1 insane ward, 3 medical wards for enlisted men, and 1 for officers. The exanthemata and other acute infectious diseases are not treated at this hospital, and the same is true of venereal diseases. Such cases of this class as are enumerated in the table given below were admitted and transferred to other hospitals as soon as the diagnosis could be determined. The following table gives the number of cases treated in the medical wards which are grouped under general heads:

Insanity	35
Dysentery	303
Other intestinal diseases	193
Dengue	137
Typhoid fever	12
Malarial fevers	295
Rheumatism	59
Nephritis, acute and chronic	21
Pulmonary tuberculosis	88
Venereal diseases	261
Heat exhaustion	3
Cholera	5
Variola	7
Beri-beri	19
Malingering	3
All other diseases	388
Complicating diseases	17
Total	1,844

Among other important surgical operations performed, 37 were for the radical cure of inguinal hernia; 23 for appendicitis; 3 for ventral

hernia; 2 for abscess of liver; 6 other laparotomies, 1 being for perforating gunshot wound of the abdomen with excessive tearing of the common iliac vein; 6 external perineal urethrotomies, 4 with and 2 without a guide; 2 trephine operations for fractures of the cranium; 1 excision of the anterior half of the tongue for malignant disease, and 1 excision of a large sarcoma of the groin involving the sheath of the external iliac artery. Of the 100 capital operations performed, 70 required invasion of the peritoneal cavity. A summary of the work performed in the surgical department shows that 427 cases were subjected to operation; of which 9 resulted fatally, and that 4 deaths resulted in the 169 cases treated without operation, or a total of 13 deaths occurred in the 596 cases treated.

A total of 923 cases was treated in the eye, ear, nose, and throat department, 513 being of the eye and 410 of the ear, nose, and throat.

During the year 231 analyses were made in the chemical laboratory, as follows:

Whisky	44
Sherry	2
Flour	3
Drugs	15
Condensed milk	3
Human milk	2
Water	160
Gunpowder captured from Moros	1
Urinary concretion	1
Total	231

Very valuable work was performed in the pathological laboratory during the year which may be summarized as follows:

Examinations of blood:	
For malarial parasites	1,765
For serum reactions	117
Blood counts	343
Blood cultures	5
Total	2,230

In the examination of the blood for malarial parasites First Lieut. H. M. Smith, assistant surgeon, U. S. Army, reports finding in 119 cases of the estivo-autumnal type a form so peculiar as to make it difficult to decide whether it was really a malarial parasite or some other organism entirely distinct. The blood of these 119 patients showed only small hyaline disks of an oval, spindle form, their short diameters varying from one-fifth to one-tenth the diameter of the infected red corpuscles and their long diameters being about twice as great. They have a very sharply defined outline, are highly refractive, and in the center of each form is a small round dot of hemoglobin. They have no ameboid motion whatever, but many of them, and this is their most peculiar characteristic, possess a motility of their own, moving around the periphery of the infected corpuscles or across them in any direction. They contain no pigment whatever and stain with great difficulty.

Examinations of urine	2,584
Examinations of stools	1,220
Examinations of sputum	604
Miscellaneous examinations	132
Necropsies	39

Tissues of all abnormal organs are examined microscopically and complete pathologic and bacteriologic reports are made in each case, the findings being embodied in the monthly sick and wounded reports of the hospital.

Microscopic sections from necropsy material	258
Gross pathological specimens preserved	39

ARMY MEDICAL MUSEUM.

The total number of specimens in the Army Medical Museum at the end of the fiscal year, June 30, 1904, was 35,067. The following statement shows in detail the additions and changes in the different sections:

Pathological section:	
In Museum June 30, 1903	12,520
Discarded	152
Donated to the Bureau of Animal Industry	1
	153
	12,367
Transferred from anatomical section	2
Received during the year	245
	12,614
In Museum June 30, 1904	
Anatomical section:	
In Museum June 30, 1903	1,669
Discarded	1
Transferred to U. S. National Museum	619
Transferred to pathological section	2
	622
	1,047
Received during the year	121
	1,168
In Museum June 30, 1904	
Section of comparative anatomy:	
In Museum June 30, 1903	1,416
Discarded	5
Donated to Bureau of Animal Industry	1
	6
	1,410
In Museum June 30, 1904	
Microscopical section:	
In Museum June 30, 1904	12,916
Miscellaneous section:	
In Museum June 30, 1903	2,759
Received during the year	72
	2,831
In Museum June 30, 1904	
Provisional pathological section:	
In Museum June 30, 1903	1,205
Discarded	1
Donated to Bureau of Animal Industry	1
Donated to physicians	2
	4
	1,201
In Museum June 30, 1904	1,201

Provisional anatomical section:

In Museum June 30, 1903.....	646
Transferred to U. S. National Museum.....	250

In Museum June 30, 1904..... 806

Photographic series:

In Museum June 30, 1903.....	2,523
Received during the year.....	8

In Museum June 30, 1904..... 2,531

RECAPITULATION.

Specimens in Museum June 30, 1903.....	35,654
Discarded, transferred, and donated.....	1,033

34,621

Added during the year..... 446

Specimens in Museum June 30, 1904..... 35,067

The following are some of the more interesting specimens received during the past fiscal year:

Malformation.—Specimen 12849. Human ischiopagus; Filipino; contributed by F. W. Donoho, sergeant, hospital corps, U. S. Army. Specimen 12817. Tricephalus puppy; contributed by L. M. Dugan, Washington, D. C.

Parasites.—Specimen 12814. *Filaria immitis* in heart of dog; contributed by U. S. College of Veterinary Surgeons, Washington, D. C. Models of distoma (12798), trematode (12799), and tapeworm (12800); purchased.

Injuries of bones and joints.—Specimen 12737. Fracture of skull of Filipino by a campilan; death; contributed by First Lieut. W. T. Davidson, assistant surgeon, U. S. Army. Specimen 12870. Healed fracture of lower jaw of mule; contributed by W. C. Benton, Middleburg, Va. Specimen 12750. Fracture of thoracic vertebra, caused by crush in elevator; girl, 18 years old; laminectomy; death; contributed by Dr. E. A. Balloch, Washington, D. C. Specimen 12828. Fracture of cervical vertebra and degeneration of spinal cord; man, age 25; laminectomy; death; contributed by Dr. E. A. Balloch, Washington, D. C. Specimen 12829. Fracture of femur from fall; woman, age 44; amputation; recovery; contributed by Dr. A. P. Hickling, Washington, D. C. Specimens 12822-12823. Osteoarthritis of knee, following shot injury forty years previously; loose bodies in joint; removed post-mortem; contributed by Dr. D. S. Lamb, Washington, D. C.

Tumors of limbs.—Specimen 12741. Sarcoma of leg; soldier; amputation; recovery; recurrence in lung; contributed by Maj. W. C. Borden, surgeon, U. S. Army. Specimen 12826. Sarcoma of tibia; soldier, age 22; removed by First Lieut. P. C. Field, assistant surgeon, U. S. Army. Specimen 12846. Sarcoma of thigh; man, age 62; tumor removed post-mortem; contributed by Dr. De W. Chadwick, Washington, D. C.

Retroperitoneal sarcoma.—Specimen 12825. Removed post-mortem; man, age 29; contributed by Dr. E. A. Balloch, Washington, D. C.

Brain and membranes.—Specimen 12734. Cerebral hemorrhage; man, age 26; 12735, man, age 38; 12863, man, age 55; 12807, man, age 56; contributed by Dr. D. S. Lamb, Washington, D. C. Specimens 12830-12831. Hemorrhage and old fracture of skull; trephining; death; contributed by Dr. D. P. Hickling, Washington, D. C. Specimen 12852. Abscess of brain; man, age 76; trephining; death; contributed by Dr. D. P. Hickling, Washington, D. C. Specimen 12801. Leptomeningitis; man, age 40; no history of injury; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12878. Meningitis in child, 3 years old; contributed by Dr. G. S. Acker, Washington, D. C. Specimen 12819. Chronic pachymeningitis, woman, age 55; contributed by Dr. D. P. Hickling, Washington, D. C.

The eye enucleated because of staphylococci; Specimen 12833, injury; 12853, choroiditis; 12827, paracanthoma; 12825, iridocyclitis; 12826, 12832, 12834, 12802, all contributed by Dr. R. S. Lamb, Washington, D. C.

Heart and circulation.—Specimen 12813. Subpericardial hemorrhage; man, age 21, contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12858. Vegetative endocarditis, woman, age 25; rheumatism; contributed by Dr. D. S. Lamb, Washington, D. C. 12862. Hypertrophy, weight 1½ ounces; man, age 55; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12844. Hypertrophy and pericard-

itis; man, age 46; contributed by Dr. D. S. Lamb, Washington, D. C. Specimens 12840-12841. Hypertrophy, pericarditis and goiter; woman, age 60; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12862. Hypertrophy, weight 27 ounces, and pericarditis; woman, age 41; contributed by Dr. D. P. Hickling, Washington, D. C. Specimen 12748. Aneurism of aorta; soldier, age 31; contributed by Capt. W. P. Chamberlain, assistant surgeon, U. S. Army. Specimen 12921. Chronic adenitis; contributed by Maj. W. F. Lippitt, surgeon, U. S. Army.

Lungs.—Specimens 12836-12837. Abscess of lung in girl, age 14; due to iron rivet; contributed by Dr. J. W. Chappell, Washington, D. C. Specimen 12740. Sarcoma of lung, secondary to sarcoma of leg, 12741; contributed by Maj. W. S. Arthur, surgeon, U. S. Army. Specimen 12859. Cancer of lung; woman, age 43; had cancer of mamma, uterus, and glands; contributed by Dr. J. W. McClellan, Washington, D. C.

Teeth and mouth.—Specimen 12861. Tartar; contributed by Williams Donnally, D. D. S., Washington, D. C. Specimen 12871. Tartar; woman, age 35; had worn a plate without removal for seven years; contributed by J. E. McConnell, D. D. S. Specimen 12821. Salivary calculus; contributed by Dr. S. R. Karpeles, Washington, D. C. Anomalies of teeth; Specimen 12848; contributed by L. B. Rowland, D. D. S., Hagerstown, Md. Specimens 12742-12744. Contributed by C. F. Hugo, D. D. S., Washington, D. C. Specimens 12745-12746. Contributed by J. D. Milliken, dental surgeon, U. S. Army.

Stomach and intestines.—Specimen 12860. Gastro-enterostomy for cancer of stomach and pancreas; man, age 48; lived 1½ years afterwards; contributed by Dr. I. S. Stone, Washington, D. C. Specimen 12736. Sarcoma of intestines; contributed by Dr. C. G. Stone, Washington, D. C. Specimen 12851. Gangrenous vermiform appendix; contributed by First Lieut. H. H. Rutherford, assistant surgeon, U. S. Army.

Liver, pancreas, and spleen.—Specimens 12809-12811: Congenital syphilis of liver and spleen and hydrocele; child, 2 months old; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12753: Gall bladder removed because of inflammation; woman, age 49; recovery; contributed by Dr. I. S. Stone, Washington, D. C. Specimen 12806: Cancer of pancreas; man, age 63; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12808: Pigmented spleen, malaria; man, age 56; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12925: Cancer of spleen; general cancer; contributed by Dr. F. J. Shadd, Washington, D. C. Specimens 12867-12869: Leukemic spleen; weight, 66 ounces; with portal dilatation and erosion; man, age 24; contributed by Dr. N. D. Graham, Washington, D. C.

Urinary organs.—Specimen 12749: Cysts of kidney; soldier, age 35; removed by post-mortem; contributed by Dr. Ira C. Brown, contract surgeon, U. S. Army. Specimen 12922: Cysts of kidneys removed ante-mortem. Specimen 12932: Cysts of kidney removed post-mortem; contributed by Dr. J. T. Kelley, Washington, D. C. Specimen 12812: Embolism of kidney; man, age 63; heart disease; contributed by Dr. D. S. Lamb, Washington, D. C. Specimen 12839: Abscess of kidney in horse following castration; contributed by United States College Veterinary Surgeons, Washington, D. C. Specimen 12754: Calculus and bullet in bladder forty years after shot wound; removed; death; contributed by Drs. D. C. Huffmann and F. W. Roush, National Military Home, Ohio. Specimen 12738: Rupture of uterus; contributed by Dr. H. D. Fry, Washington, D. C. Specimen 12827: Hydatidiform mole; contributed by Dr. V. B. Jackson, Washington, D. C. Specimen 12924: Much hypertrophy of mamma; contributed by Dr. George Ben Johnston, Richmond Va.

From Indian mounds.—Specimen 12872: Periostitis. Specimens 12874-12876: Syphilitic periostitis. Specimen 12864: Osteo-arthritis; received in exchange from U. S. National Museum.

Seventy-one models of diseases of skin were purchased from Doctor Baretta, of the St. Louis Hospital, Paris, and Dr. D. H. Goodwillie, of Yonkers, N. Y., presented to the Museum a series of 70 models in wax or plaster showing a variety of diseases and injuries.

Asst. Surg. E. H. Hartnett, U. S. Army, sent to the Museum the following interesting series of weapons collected by him from the natives of the Philippine Islands: Specimens 2857 and 2858, miscellaneous section. Decapitation axes used in battle by the Moros of Mindanao, P. I.

2859, 2860, and 2861. Borongs of the Moros of the Sulu, P. I.

2862, 2863, 2864, and 2872. Kris of the the Moros of Mindanao.

2865. Campilan of the Moros of Mindanao, P. I. Along the back of the blade are holes plugged with brass said to indicate the number of decapitations performed with the instrument.

2866, 2867, 2868. Bolos from the island of Panay and northern coast of Mindanao.

2869. Pira of the Moros of the island of Basilan, P. I.

2870. Ticon of the Moros, island of Mindanao, P. I.

871. Spear of the Moros of Mindanao, P. I.

LIBRARY OF THE SURGEON-GENERAL'S OFFICE.

The following table shows the additions made to the library during the fiscal year 1903-4:

Description.	On hand June 30, 1903.	Added during fiscal year.	Total June 30, 1904.
	<i>Volumes.</i>	<i>Volumes.</i>	<i>Volumes.</i>
Medical journals	44,694	1,329	46,023
Medical transactions	7,178	163	7,341
Bound theses	2,248	71	2,319
Bound pamphlets	2,870	5	2,875
Other medical books	91,417	1,892	93,309
Total	148,407	3,460	151,867
Medical theses	65,566	3,288	68,854
Medical pamphlets	187,206	6,334	193,540
Total	252,772	9,622	262,394

Of the total number of theses on hand June 30, 1903, there were 791 bound in 71 volumes during the year.

There were presented to the library during the year 618 books and 9,382 pamphlets and journals.

Volume IX, second series of the Index Catalogue, includes the letter "L," and forms a volume of 938 pages. It will be ready for distribution at the usual time. The appropriation for Volume X, second series, having been made, the manuscript is in course of preparation for the printer.

It was foreseen in 1896 that the available shelf room for the steadily increasing number of volumes would very soon be exhausted. An appropriation of \$6,000 was requested for the construction of six iron book stacks similar to those now in use, including iron supports, stairway, perforated iron floor, and wood shelves. Year by year Congress has failed to make the appropriation and the amount of money asked for has of necessity been increased, not because any more extensive construction is now wanted than when first estimated for, but because the price of both material and workmanship seems to have doubled. Unless the appropriation, now estimated at \$13,000, is allowed without further delay, the library will be unable to locate its own books without great delay and trouble. New books, for lack of shelf room, are stacked upon the floors and piled on top of the rows as near as possible to the section where they would naturally be placed if there were room enough. This library is recognized as the largest and most useful medical library in the world. It is in constant use by nearly every American university, medical library and society, and by hundreds of individual workers. The library force indexes practically all the existent literature of medicine in all its branches. The Index Catalogue of subjects, as well as authors, is a handbook in every great library at home and abroad. The shelves asked for are now absolutely necessary to the continuance of the efficiency of the library, and will, it is believed, if granted, be sufficient for the present collection and its increase for ten years.

CLASSIFICATION OF DISEASES.

Since 1895 until this year statistics of diseases and injuries in the Army have been based on an official nomenclature adopted at that time, the only modifications having been slight ones necessitated by advances in medical science and by changed conditions of service since the Spanish-American war during the continuance of which the classification was also temporarily abridged, as sufficient clerical force was not available for the compilation of full statistics.

The old nomenclature was a thoroughly scientific one, but was not comparable with the International Classification of Causes of Death, which may now be properly regarded as the general system of the country, it having been adopted by the Census Office, by all the registration States, by many of the nonregistration and by almost all of the registration cities for their local statistics.

In the interest of uniformity, therefore, beginning with this year, army statistics will henceforth be based on the International Classification, however, as morbidity as well as mortality statistics are compiled for the Army, and as many diseases are encountered in the Tropics which naturally are not classified separately under the international system, it has been found necessary to expand the detailed form of the census to meet army requirements.

The following is the list now in use:

I.—GENERAL DISEASES.

(a *Epidemic diseases.*)

1. Typhoid fever.
2. Exanthematic typhus.
3. Relapsing fever.
- 4a. Malarial fever, intermittent.
- 4b. Malarial fever, remittent or continued.
- 4c. Malarial fever, pernicious.
- 4d. Malarial cachexia.
5. Smallpox.
6. Measles.
7. Scarlet fever.
8. Whooping cough.
9. Diphtheria.
10. Influenza.
11. Miliary fever.
12. Asiatic cholera.
13. Cholera nostras.
- 14a. Acute dysentery.
- 14b. Chronic dysentery.
15. Bubonic plague.
16. Yellow fever.
17. Leprosy.
18. Erysipelas.
- 19a. Berl-berf.
- 19b. Dengue.
- 19c. Mumps.
- 19d. Rubella.
- 19e. Varicella.
- 19f. Vaccinia.
- 19g. Other epidemic diseases.

(b *Other general diseases.*)

20. Purulent infection and septicemia.
21. Glanders and farcy.
22. Anthrax.
23. Rabies.
24. Actinomycosis, trichinosis, etc.
25. Pellagra.
26. Tuberculosis of the larynx.
27. Tuberculosis of the lungs.
28. Tuberculosis of the meninges.
29. Abdominal tuberculosis.

I.—GENERAL DISEASES—Continued.

(b *Other general diseases*)—Continued.

30. Pott's disease.
31. Tuberculous abscess.
32. White swelling.
33. Tuberculosis of other organs.
34. General tuberculosis.
35. Scrofula.
- 36a. Syphilis, primary.
- 36b. Syphilis, secondary.
- 36c. Syphilis, tertiary.
- 36d. Syphilis, hereditary.
- 36e. Chancroid.
- 37a. Gonorrhea.
- 37b. Gonorrheal epididymitis and orchitis.
- 37c. Gonorrheal ophthalmia.
- 37d. Gonorrheal rheumatism.
39. Cancer and other malignant tumors of the buccal cavity.
40. Cancer and other malignant tumors of the stomach and liver.
41. Cancer and other malignant tumors of the peritoneum, intestines, and rectum.
44. Cancer and other malignant tumors of the skin.
45. Cancer and other malignant tumors of other organs and unspecified.
46. Other tumors.
47. Acute articular rheumatism.
48. Chronic rheumatism and gout.
49. Scurvy.
50. Diabetes.
51. Exophthalmic goitre.
52. Addison's disease.
53. Leukemia.
54. Anemia.
55. Other general diseases.
- 56a. Acute alcoholism.
- 56b. Delirium tremens.
- 56c. Chronic alcoholism.
57. Chronic lead poisoning.
58. Other chronic poisonings (occupational).
- 59a. Narcotic poisonings, chronic.
- 59b. Other chronic poisonings.

II.—DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE.

- 60. Encephalitis.
- 61a. Meningitis.
- 61b. Meningitis, epidemic cerebro-spinal.
- 62. Progressive locomotor ataxia.
- 63. Other diseases of the spinal cord.
- 64. Cerebral congestion and hemorrhage.
- 65. Softening of the brain.
- 66. Paralysis without specified cause.
- 67. General paralysis.
- 68. Insanity.
- 69. Epilepsy.
- 70. Convulsions (eclampsia).
- 72. Tetanus.
- 73. Chorea.
- 74a. Neuralgia.
- 74b. Neuritis.
- 74c. Neurasthenia.
- 74d. Notalgia.
- 74e. Other diseases of the nervous system.

Of the eye and its adnexa.

- 75a. Lids, diseases of.
- 75b. Lachrymal apparatus, diseases of.
- 75c. Conjunctivitis, acute.
- 75d. Conjunctivitis, chronic.
- 75e. Keratitis.
- 75f. Scleritis.
- 75g. Choroid, diseases of.
- 75h. Iritia.
- 75i. Retinitis.
- 75j. Snow-blindness.
- 75k. Asthenopia.
- 75l. Cataract.
- 75m. Glaucoma.
- 75n. Amaurosis.
- 75o. Night blindness.
- 75p. Other diseases of the eye.

Of the ear and its adnexa.

- 76a. Diseases of the external ear.
- 76b. Diseases of the tympanum.
- 76c. Diseases of the middle and internal ear.
- 76d. Deafness.
- 76e. Other diseases of the ear.

III.—DISEASES OF THE CIRCULATORY SYSTEM.

- 77. Pericarditis.
- 78. Acute endocarditis.
- 79. Organic diseases of the heart.
- 80a. Angina pectoris.
- 80b. Cardiac irritability.
- 81a. Aneurism.
- 81b. Other diseases of the arteries.
- 82. Embolism and thrombosis.
- 83a. Varicocele.
- 83b. Varicose veins.
- 83c. Hemorrhoids.
- 83d. Phlebitis.
- 83e. Other diseases of the veins.
- 84a. Adenitis, non-suppurative, nonvenereal.
- 84b. Lymphangitis.
- 84c. Other diseases of the lymphatic system.
- 85. Hemorrhages.
- 86. Other diseases of the circulatory system.

IV.—DISEASES OF THE RESPIRATORY SYSTEM.

- 87a. Coryza.
- 87b. Chronic nasal catarrh.
- 87c. Nasal polypus.
- 87d. Other diseases of the nasal fossae.
- 88. Diseases of the larynx.
- 89. Diseases of the thyroid body.
- 90. Acute bronchitis.
- 91. Chronic bronchitis.
- 92. Broncho-pneumonia.
- 93. Pneumonia.
- 94. Pleurisy.
- 95. Congestion and apoplexy of the lungs.
- 96. Gangrene of the lungs.
- 97. Asthma.
- 98. Pulmonary emphysema.
- 99. Other diseases of the respiratory system, phthisis excepted.

V.—DISEASES OF THE DIGESTIVE SYSTEM.

- 100a. Diseases of the salivary glands and ducts.
- 100b. Diseases of teeth, gums, and alveoli.
- 100c. Diseases of mouth and tongue.
- 101a. Tonsillitis.
- 101b. Other diseases of the pharynx.
- 102. Diseases of the esophagus.
- 103. Ulcer of the stomach.
- 104a. Dyspepsia.
- 104b. Gastritis.
- 104c. Other diseases of the stomach, except cancer.
- 106a. Diarrhea, acute.
- 106b. Diarrhea, chronic.
- 106c. Enteritis.
- 107. Intestinal parasites.
- 108a. Inguinal hernia.
- 108b. Other hernia.
- 108c. Intestinal obstruction.
- 109a. Fistula in ano.
- 109b. Other diseases of the intestines.
- 110. Acute yellow atrophy of the liver.
- 111. Hydatid tumors of the liver.
- 112. Cirrhosis of the liver.
- 113. Biliary calculi.
- 114a. Acute hepatitis.
- 114aa. Hepatic abscess.
- 114b. Jaundice, catarrhal.
- 114c. Other diseases of the liver.
- 115. Diseases of the spleen.
- 116. Simple peritonitis.
- 118. Appendicitis and abscesses of iliac fossa.
- 117. Other diseases of the digestive system, cancer and tuberculosis excepted.

VI.—DISEASES OF THE GENITO-URINARY SYSTEM AND ITS ADNEXA.

- 119. Acute nephritis.
- 120. Bright's disease.
- 121a. Pyelitis and pyelonephritis.
- 121b. Other diseases of the kidneys.
- 122a. Renal calculi.
- 122b. Vesical calculi.
- 123a. Cystitis.
- 123b. Other diseases of the bladder.
- 124a. Stricture of the urethra.
- 124b. Other diseases of the urethra.
- 125a. Prostatitis.
- 125b. Prostatic hypertrophy.
- 125c. Other diseases of the prostate.
- 126a. Balanitis, nongonorrheal.
- 126b. Paraphimosis.
- 126c. Phimosis.
- 126d. Hematocele.
- 126e. Hydrocele.
- 126f. Orchitis, nonvenereal.
- 126g. Other nonvenereal diseases of the genital organs.

VIII.—DISEASES OF THE SKIN AND CELLULAR TISSUE.

- 142. Gangrene.
- 143a. Carbuncle.
- 143b. Furuncle.
- 144a. Acute abscess, phlegmon.
- 144b. Adenitis, suppurative, nonvenereal.
- 144c. Inguinal lymphadenitis, suppurative.
- 145a. Corns and warts.
- 145b. Ingrowing nail.
- 145c. Chilblain.
- 145d. Ulcer.
- 145e. Dermatitis from poisonous plants.
- 145f. Erythemat.
- 145g. Herpes.
- 145h. Eczema and pemphigus.
- 145i. Impetigo and acne.
- 145j. Urticaria.
- 145k. Scabies.
- 145l. Dhobie Itch.
- 145m. Other diseases of the skin and its adnexa.

IX.—DISEASES OF THE ORGANS OF LOCOMOTION.

- 146a. Osteomyelitis.
- 146b. Caries and necrosis of bone, nontubercular.
- 146c. Periostitis.
- 146d. Other nontubercular diseases of the bones.
- 147a. Arthritis.
- 147b. Bunion.
- 147c. Synovitis.
- 147d. Other diseases of the joints, except tuberculosis and rheumatism.
- 149a. Muscular rheumatism and myalgia.
- 149b. Other diseases of the organs of locomotion.

XII.—OLD AGE.

- 154. Senile debility.

XIII.—EXTERNAL CAUSES.

- 155. Suicide by poison.
- 156. Suicide by asphyxia.
- 157. Suicide by hanging or strangulation.
- 158. Suicide by drowning.
- 159. Suicide by firearms.
- 160. Suicide by cutting instruments.
- 161. Suicide by jumping from high places.
- 162. Suicide by crushing.
- 163. Suicide by other means.
- 164. Fractures, exclusive of gunshot.
- 165a. Dislocations.
- 165b. Sprains.
- 165c. Strain, muscular.
- 166a. Abrasions and blisters (mechanical).

XIII.—EXTERNAL CAUSES—Continued.

- 166b. Compression of brain.
- 166c. Concussion of brain.
- 166d. Concussion of spine.
- 166e. Wounds, contused.
- 166f. Wounds, incised.
- 166g. Wounds, lacerated.
- 166h. Wounds, punctured.
- 166i. Wounds, gunshot.
- 166j. Crushing.
- 166k. Other traumatisms.
- 167. Burns and scalds.
- 168. Burns by corrosive substances.
- 169. Sunstroke.
- 170a. Frostbite.
- 170b. Freezing.
- 171. Electric shock.
- 172. Drowning.
- 173. Inanition (starvation, exclusive of disease).
- 174. Absorption of deleterious gases.
- 175a. Narcotic poisonings, acute.
- 175b. Corrosive and irritant poisonings, acute.
- 175c. Venomous bites, stings, and wounds.
- 175d. Other acute poisonings.
- 176a. Exhaustion from fatigue and exposure.
- 176b. Explosion.
- 176c. Suffocation, exclusive of disease.
- 176d. Foreign bodies, presence of.
- 176e. Other external violence.
- 176f. Homicide.
- 176g. Judicial execution.
- 176h. Self-maiming.
- 176i. Killed in battle.

UNIFORMITY IN MEDICO-MILITARY STATISTICS.

The International Commission for the the Unification of the Medical Statistics of Armies met in Madrid in April, 1903. The following delegates were present: Wurdinger, of Bavaria; Paalzow, of Prussia; Maistriau, of Belgium; Bondesen, of Denmark; Reig, Sanchez, and Castillo, of Spain; Antony and Alvernhe, of France; McCulloch, of Great Britain; Daniels, of Holland; Sforza, of Italy; Honda et Uyama, of Japan; Camolino, of Portugal; Tauber, of Russia; Lamberg, of Sweden; Schweigaard, of Norway; and O'Reilly and Heizmann, of the United States.

It was found that since the last meeting held in Paris in 1900 the number of countries publishing the international statistics had increased to nine. The announcement was made that many other countries were preparing to publish them in the near future.

The conference after a two days session, during which the subject of army statistics was thoroughly discussed, decided to add pleuritis and ulcus molle to the nomenclature which will now comprise 35 diseases, and to adopt two new tables.

According to the new arrangement, Table No. I provides for movement of sick by army corps (departments), absolute numbers; No. II, movement of sick by army corps (departments), proportionate numbers; No. III, movement of sick by arms of service; No. IV, movement of sick, by months; No. V, movement of sick in the larger garrisons; No. VI, movement of sick according to most important diseases; No. VII, most important diseases by arms of service; No. VIII, most important diseases by months; No. IX, deaths by rank, by length of service, and by age, and No. X, discharges from the army for physical disability, temporary or permanent, by rank, by length of service, and by age.

Statistics for the past year, classified in accordance with the recommendations of the Commission, will be found at the end of this report.

CONCLUSION.

In closing this report I desire to express my high appreciation of the intelligent and zealous devotion to duty which has characterized the officers of the Medical Department, the contract surgeons, and contract dental surgeons during the year. The chief surgeon on duty in the Philippine Islands has occupied an especially responsible position, and has discharged his duties in a manner most creditable to himself and to the Department.

Through the efforts of the efficient clerical force, under the direction of Mr. George A. Jones, chief clerk, who has exhibited a high degree of efficiency in performing the responsible duties attached to his position, the work of my office has been continuously kept up to date and conducted in a most satisfactory and systematic manner.

STATISTICAL TABLES.

The following tables show in detail the statistical data on which the statements of this report are based:

I. Numerical view of the effect of disease and injury on United States troops performing insular and home service in the year 1903, compared with the corresponding data for 1902 and for the decade 1892-1901.

II. Monthly mortality and prevalence of disease and injury in the Army at home and on insular service for 1903.

III. Admissions to sick report, discharges and deaths in the Army, with ratios per 1,000 of mean strength in which all available data for the decade 1892-1901 are placed in comparison with the year 1903.

IV. Admissions to sick report, discharges, and deaths in the Army and by races, with ratios per 1,000 of mean strength for the year 1903.

V. Admissions to sick report, discharges, and deaths in the Army at home and on insular service, with ratios per 1,000 of mean strength for the year 1903.

VI. Admissions to sick report, discharges, and deaths in the Army by arms of service, with ratios per 1,000 of mean strength for the year 1903.

INTERNATIONAL SERIES.

Tables I to X, inclusive.

Respectfully submitted:

R. M. O'REILLY,
Surgeon-General, U. S. Army.

Hon. WILLIAM H. TAFT,
Secretary of War.

740	10.94	22	.38	11	17	700	11.73	22	.37	11	18	25	7.85			15	3.13	
Enteritis.....	137	2.03				137	2.30											
Intestinal parasites.....	226	3.34	45	67		226	3.59	45	75			6	1.86			6	1.25	
Inguinal hernia.....	19	2.8	6	.09		16	2.7	6	.10			2	.63			1	.21	
Other hernia.....	8	1.2				8	.13			3	.05							
Intestinal obstruction.....	63	.93				58	.97					3	.94			2	.42	
Fistula in ano.....	2,350	34.88	7	.10		2,063	35.08	7	.12			93	29.22			173	36.12	
Other diseases of the intestines.....	1	.01				1	.02			1	.02							
Acute yellow atrophy of the liver.....	5	.07				1	.08											
Cirrhosis of the liver.....	19	.28				19	.32			1	.02							
Biliary calculi.....	26	.38				25	.42											
Acute hepatitis.....	25	.37				23	.39			10	.17					1	.21	
Hepatic abscess.....	171	2.53				167	2.80					1	.31					
Jaundice, catarrhal.....	50	.74	1	.01		48	.80	1	.02			2	.63			3	.63	
Other diseases of the liver.....	171	2.53				167	2.80											
Diseases of the spleen.....	50	.74	1	.01		48	.80	1	.02							2	.42	
Simple peritonitis.....	8	.12	1	.01	4	.06	.07	1	.02	4	.07							
Appendicitis and abscesses of iliac fossa.....	208	3.07	5	.07	8	.12	202	3.39	5	.08	7	.12	6	1.89		1	.31	
Other diseases of the digestive system, cancer and tuberculosis excepted.....	4	.06	2	.03	1	.01	.07	2	.03	1	.02							
Total for the digestive system.....	20,281	299.82	112	1.66	49	72	313.80	112	1.88	44	74	654	205.47			902	188.34	8 .03
VI. DISEASES OF THE GENITO-URINARY SYSTEM AND ITS ADJEXA.																		
Acute nephritis.....	82	.77	1	.01	4	.06	.45									7	1.46	
Bright's disease.....	64	.60	13	.21	14	.21	.53	.75	1	.02	4	.07				1	.31	
Nephritis and pyelonephritis.....	24	.35	2	.03			.15	.39	14	.23	13	.22						
Other diseases of the kidneys.....	27	.40			1	.01	.19	.32	2	.03			3	.94		1	.31	
Renal calculi.....	2	.03					.24	.40								3	.63	
Cystitis.....	124	1.83	1	.01			.03						6	1.89		1	.21	
Other diseases of the bladder.....	63	1.02	11	.17			.17	1.07	11	.18			5	1.57				
Stricture of the urethra.....	85	1.26					.79	1.32	49	1	.02		6	1.89				
Other diseases of the urethra.....	30	.44	1	.01			.29	.49	1	.02			1	.31		1	.21	
Prostatitis.....	9	.13					.8	.13										
Prostatic hypertrophy.....	1	.01						.02					1					
Balanitis, nongonorrheal.....	43	.64					.42	.70								1	.21	
Paraphimosis.....	12	.18					12	.20										
Phimosis.....	211	3.12					180	3.02				20	6.28			11	2.30	
Hematocoele.....	60	.89	2	.03			.56	.94	2	.03						4	.84	
Hydrocoele.....	94	1.39	1	.01			.78	1.31	1	.02		5	1.57			11	2.30	
Orchitis, nonvenereal.....																		
Other nonvenereal diseases of the genital organs.....	210	3.10	4	.06			199	3.33	3	.05		5	1.57			6	1.25	
Total genito-urinary system and its adnexa.....	1,116	16.50	37	.55	19	.28	1,017	17.04	36	.60	17	.28	51	16.02		1	.31	2 .63
																		10.02.....

ARTHRITIS.													
105	1.55	7	.10	95	44.22	93	1.56	8	2.51	2	.42	2	.42
42	.62	5	.07	36	2.61	5	.08	5	1.57	1	.21	1	.21
171	2.53	13	.19	156	2.61	13	.22	10	3.14	5	1.04	5	1.04
Other diseases of the joints, except													
103	1.52	26	.38	98	1.64	25	.42	3	.94	2	.42	1	.21
2,301	34.02	9	.13	2,021	33.87	9	.15	195	61.26	85	17.75	85	17.75
Muscular rheumatism and myalgia													
116	1.71	15	.22	108	1.81	14	.23	4	1.26	4	.84	1	.21
Other diseases of the organs of locomotion.													
2,973	43.95	95	1.40	2,639	44.22	93	1.56	232	72.88	102	21.30	2	.42
Total organs of locomotion.													
ALL OLD AGE.													
3	.04	1	.01	3	.05	1	.02						
SEXES AND SEXES.													
69	1.02			67	1.12					2	.42		
276	4.08			249	4.17			4	5.84	10	2.09		
345	5.10	1	.01	316	5.30			4	5.34	12	2.51		
83,085	1,228.45	1,462	21.61	75,027	1,248.84	1,379	23.11	358	6.00	2,452	45.10	2	.42
Total of disease.													
VIII. EXTERNAL CAUSES.													
3	.04			3	.05			5	.08	1	.31		
1	.01			1	.01			1	.02				
3	.04			2	.03			19	.32	1	.31		
1	.01			3	.04			2	.03	1	.31		
113	1.07	25	.37	118	1.06	23	.39	11	1.18	27	8.48	1	.21
243	3.99	4	.06	3	.04			4	.07	2	.83		
3,329	52.17	9	.13	3,253	54.52	9	.15	213	66.91	63	13.15		
881	13.02			899	13.39			64	20.11	18	3.76		
960	14.12			966	15.15			23	7.25	60	12.53		
30	.14			27	.13			1	.02	1	.21		
30	.14			27	.13			2	.03	3	.94		
3	.07			3	.06			1	.02	1	.21		
682	10.08			635	10.64			26	8.17	21	4.39		
1,222	18.06	12	.18	1,090	18.26	12	.20	65	20.42	67	13.99		
1,030	15.23	8	.12	961	16.10	8	.13	53	16.65	16	3.34		
450	6.65	1	.01	414	6.94	1	.02	23	7.23	13	2.71		
192	2.84	45	.67	157	2.63	44	.74	17	5.03	20	4.18		
4,200	62.08	12	.18	3,885	65.11	10	.17	14	23	246	77.28	2	.63
314	4.64			291	4.88			14	4.40	9	1.88		
19	.28			19	.32			1	.02	4	1.26		
198	2.93			185	3.10			1	.02	9	1.88		
50	.74	3	.04	35	.59	2	.03	15	4.71	1	.31		
Total.													
1,222	18.06	12	.18	1,090	18.26	12	.20	65	20.42	67	13.99		
1,030	15.23	8	.12	961	16.10	8	.13	53	16.65	16	3.34		
450	6.65	1	.01	414	6.94	1	.02	23	7.23	13	2.71		
192	2.84	45	.67	157	2.63	44	.74	17	5.03	20	4.18		
4,200	62.08	12	.18	3,885	65.11	10	.17	14	23	246	77.28	2	.63
314	4.64			291	4.88			14	4.40	9	1.88		
19	.28			19	.32			1	.02	4	1.26		
198	2.93			185	3.10			1	.02	9	1.88		
50	.74	3	.04	35	.59	2	.03	15	4.71	1	.31		

TABLE IV.—Admissions to sick report, discharges, and deaths in the Army, and by races, with ratios per 1,000 of mean strength, for year 1903—Cont'd.

	The Army.						White.						Colored.						Filipinos.					
	Admissions.			Discharges.			Deaths.			Admissions.			Discharges.			Deaths.			Admissions.			Discharges.		
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
Causes of admission to sick report.																								
XIII. EXTERNAL CAUSES—continued.																								
Electric shock.....	1	0.01			1	0.01	1	0.02																
Drowning.....					39	.44																		
Absorption of deleterious gases.....	4	.06			1	.01	4	.07																
Narcotic poisonings, acute.....	6	.09					5	.08																
Corrosive and irritant poisonings, acute.....	16	.24			4	.06	16	.27																
Venomous bites, stings, and wounds.....	162	2.39					139	2.33																
Other acute poisonings.....	126	1.86			1	.01	114	1.91																
Exhaustion from fatigue and exposure.....	48	.71					46	.77																
Suffocation, exclusive of disease.....	3	.04			1	.01	3	.05																
Foreign bodies, presence of.....	28	.41					27	.45																
Homicide.....	3	.04			9	.13	3	.05																
Killed in battle.....					13	.19																		
Total external causes.....	15,063	222.68	120	1.77	154	2.28	13,832	231.80	114	1.91	132	2.21	813	255.42	5	1.67	6	1.89	418	87.29	1	.21	16	8.34
Grand total.....	98,159	1,451.13	1,582	2.23	39,029	5.30	88,322	1,480.15	1,433	25.02	490	8.21	3,265	1,025.76	40	12.67	36	11.31	6,572	1,372.82	49	10.23	103	21.51

a Mean strength includes officers.

TABLE V.—Admissions to sick report, discharges, and deaths in the Army at home and on insular service, with ratios per 1,000 of mean strength for the year 1903.

Causes of admission to sick report.	United States (continental).				Cuba and Porto Rico.				Pacific Islands and China.				Total Islands.			
	42,264				1,561				23,818				25,379			
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Discharges.	Deaths.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
Mean strength.....																
(Causes of admission to sick report.																
I. GENERAL DISEASES.																
a. Epidemic diseases.																
Typhoid fever.....	246	5.82	1	0.02	8	1.92			99	4.16			102	4.02	18	0.71
Malaria fever.....									8,994	377.61			9,089	358.14		
Intermittent.....	2,141	50.66			95	60.86			1,719	72.17			1,736	68.41		
Remittent or continued.....	330	7.81			17	10.89			1,736	72.17			1,736	68.41		
Pernicious.....	8	0.19			1	.64			173	7.26			174	6.86	26	1.08
Malarial cachexia.....	97	2.30	5	.12	1	.64			27	1.13			27	1.06	3	.12
Smallpox.....	12	.28							40	1.68			41	1.62		
Measles.....	418	9.89			1	.64										
Scarlet fever.....	11	.26														
Diphtheria.....	26	.62														
Influenza.....	2,192	51.86			104	66.62			34	1.43			138	5.44		
Adiatic cholera.....					149	6.26			149	6.26			149	5.87		
Cholera nostras.....	20	.47			27	1.13			27	1.13			27	1.06	96	3.78
Acute dysentery.....	155	3.67			11	7.05			1,544	64.83			1,555	61.27	26	1.02
Chronic dysentery.....	243	5.75	85	2.01	4	2.56			594	24.94			17	.67	17	.67
Yellow fever.....	6	.14														
Leprosy.....	1	.02														
Erysipelas.....	41	.97							7	.29			7	.28		
Bert-bert.....	1	.02	4	.09					635	26.66	5	.21	635	25.02	5	.20
Dengue.....	9	.21			4	2.56			2,450	102.86			2,454	96.70	25	.99
Mumps.....	401	9.49			12	7.69			79	3.32			91	3.59		
Rubella.....	33	.78							2	.08			2	.08		
Varicella.....	28	.66							3	.13			3	.12		
Vaccinia.....	1,364	32.27			13	8.38			118	4.90			181	5.16		
Other epidemic diseases.....	1	.02														
Total epidemic diseases.....	7,779	184.06	95	2.25	22	.62			16,731	702.45	5	.21	217	9.11	16,997	663.78
															5	.20
															217	8.55

Chronic rheumatism and gout.....	228	5.39	61	1.44		8	5.12		111	4.68		119	4.69
Scabies.....									2	.08		2	.08
Eczema.....	7	.17	4	.09	1	.02	.64		1	.04		1	.04
Exophthalmic goiter.....													
Addison's disease.....													
Leukemia.....													
Anemia.....	43	1.02	4	.09			1.28		1	.04		1	.04
Other general diseases.....									23	.97		25	.98
Acute alcoholism.....	337	7.97	5	.12			16.65		759	31.87		785	30.83
Delirium tremens.....	1,041	24.63			6	.14	80	51.25	420	17.63		500	19.70
Chronic alcoholism.....	4	.08					2.56		15	.63		19	.75
Chronic lead poisoning.....	51	1.21	11	.26	2	.05	1.28		20	.84		22	.87
Narcotic poisonings, chronic.....	5	.12	2	.05					1	.04		1	.04
Other chronic poisonings.....	15	.35	10	.24					9	.38		9	.35
Other chronic poisonings.....	1	.02			1	.02						1	.04
Total other general diseases.....	8,199	194.00	576	13.63	60	1.42	493	315.82	13	8.33		250	40
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE.									5,862	246.12		6,355	250.40
Meningitis.....	7	.17	1	.02	2	.05	.64		1	.04		2	.08
Encephalitis.....	1	.02							1	.04		1	.04
Progressive locomotor ataxia.....	4	.09	3	.07			.64		1	.04		1	.04
Other diseases of the spinal cord.....	5	.12	4	.09					2	.08		2	.08
Cerebral congestion and hemorrhage.....	11	.26	1	.02	4	.09							
Softening of the brain.....									1	.04		1	.04
Paralysis without specified cause.....	18	.43	9	.21					12	.50		12	.47
General paralysis.....	8	.07	4	.09	1	.02			25	1.05		29	1.14
Insanity.....	43	1.02	71	1.08	1	.02	4	2.56	23	.97		24	1.10
Epilepsy.....	55	1.30	35	.83			5	3.20	2	.08		3	.12
Convulsions (tetanopsis).....	1	.02							3	.13		3	.12
Tetanus.....													
Chorea.....	4	.09	2	.05					215	9.03		233	9.18
Neuralgia.....	491	11.62	4	.09			18	11.53	40	1.68		42	1.65
Neuritis.....	53	1.30	16	.38			2	1.28	43	1.81		45	1.77
Neurasthenia.....	68	1.61	10	.24			2	1.28	8	.33		8	.31
Notalgia.....	5	.12							193	8.19		204	8.04
Other diseases of nervous system.....	192	4.54	83	.78			9	5.77	1	.04		1	.04
Total nervous system.....	963	22.79	193	4.57	8	.19	42	26.91	7	4.48		607	23.92
Of the eye and its adnexa.									563	23.72		563	23.92
Lids, diseases of.....													
Lachrymal apparatus, diseases of.....	67	1.59					4	2.56	23	.97		27	1.06
Conjunctivitis.....	8	.19	2	.05					8	.34		8	.32
Acute.....													
Chronic.....	342	8.09					18	11.53	254	10.65		272	10.72
Keratitis.....	23	.54	3	.07			1	.64	16	.67		17	.68
Choroid, diseases of.....	28	.66	4	.09					16	.67		16	.63
Iritis.....	37	.88	3	.07					19	.80		19	.75

TABLE V.—Admissions to sick report, discharges, and deaths in the Army at home and on insular service, with ratios per 1,000 of mean strength for the year 1903—Continued.

Mean strength	United States (continental).				Cuba and Porto Rico.				Pacific Islands and China.				Total Islands.			
	42,264		1,561		25,818		25,379									
	Admissions.	Discharges.	Deaths.	Ratio.	Admissions.	Discharges.	Deaths.	Ratio.	Admissions.	Discharges.	Deaths.	Ratio.	Admissions.	Discharges.	Deaths.	Ratio.
Causes of admission to sick report.																
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE—continued.																
<i>of the eye and its adnexa</i> —Continued.																
Retinitis	29	0.09	8	0.19					10	0.42			10	0.39		
Snow-blindness	4	.09	1	.02					6	.25			7	.28		
Asthenopia	6	.14	1	.02	1	0.64			1	.04			1	.04		
Cataract	4	.09	2	.05					1	.04			1	.04		
Glaucoma	1	.02	1	.02					1	.04			1	.04		
Amaturosis	13	.31	12	.28					5	.21			5	.20		
Night blindness	89	2.11	1	.02					90	3.78	2	0.08	94	3.70	2	0.08
Other diseases of the eye and its adnexa			25	.59	4	2.56										
Total eye and its adnexa	654	15.47	65	1.54	28	17.94	1	0.64	450	18.89	3	.13	478	18.83	4	.16
<i>of the ear and its adnexa</i> .																
Diseases of the external ear	27	.64							33	1.39			37	1.46		
Diseases of the tympanum	6	.14	1	.02	4	2.56			2	.08			2	.08		
Diseases of the middle and internal ear	212	5.02	39	.92	17	10.89			257	10.79			274	10.80		
Deafness	11	.26	5	.12					1	.04			1	.04		
Other diseases of the ear and its adnexa	23	.54							4	.17			4	.16		
Total ear and its adnexa	279	6.60	45	1.06	21	13.45			297	12.47			318	12.63		
III. DISEASES OF THE CIRCULATORY SYSTEM.																
Pericarditis	3	.07							2	.08			2	.08		
Acute endocarditis	2	.05							2	.08			2	.08		
Organic diseases of the heart	102	2.41	83	1.96	9	.21			43	1.81	2	.06	43	1.69	3	.12
Angina pectoris	18	.43	5	.12	1	.02			10	.42	1	.04	13	.51	1	.04

Cardiac irritability	56	2.03	20	.47	1	1.28	1	.64	49	2.06	51	2.01	1	.04
Aneurism	2	.05			1	.02			1	.04				
Other diseases of the arteries	1	.02	1	.02					3		1			
Embolism and thrombosis	5	1.12	1	.02					3	.12	3	.12		
Varicose	207	4.90	5	.02	9	5.77			91	8.52	100	8.94		
Varicose veins	33	.78	1	.02	2	1.28			22	.92	24	.95		
Hemorrhoids	399	9.44	1	.02	12	7.69			247	10.37	260	10.21		
Flebitis	11	.26	3	.07					13	.35	14	.35		
Aneurism, nonpurpative (nonvenereal)	141	3.34			12	7.69			134	5.63	146	5.75		
Lymphangitis	15	.35			3	1.92			16	.67	19	.75		
Other diseases of the lymphatic system	8	.19							9	.51	3	.12		
Hemorrhages	33	.78			1	.64			9	.38	10	.38		
Other diseases of the circulatory system	22	.52	1	.02					9	.38	9	.35		
Total circulatory system	1,088	25.74	120	2.84	12	28	45	21.28	654	27.46	699	27.54	4	.16
IV. DISEASES OF THE RESPIRATORY SYSTEM.														
Coryza	1,018	24.09					15	9.61	338	14.19	353	13.91		
Chronic nasal catarrh	61	1.44	3	.07			1	.64	10	.42	11	.43		
Nasal polypus	3	.07												
Other diseases of the nasal fossae	4	.09					4	2.56	1	.04	1	.04		
Diseases of the larynx	190	4.50	1	.02					49	2.06	53	2.09		
Diseases of the thyroid body	8	.19	2	.05					3	.13	3	.12		
Acute bronchitis	2,993	70.82	3	.07	1	.02	93	59.38	788	33.09	881	34.72		
Chronic bronchitis	124	2.93					6	3.84	68	2.85	74	2.92		
Broncho-pneumonia	16	.38							8	.34	8	.32		
Pneumonia	156	3.69					4	.09	59	2.45	60	2.39		.04
Pleurisy	134	3.17	11	.36	3	.07	5	3.20	61	2.81	72	2.80		.24
Congestion and apoplexy of the lungs	57	1.33	14	.53	1	.02	4	2.56	30	1.35	34	1.34		.04
Asthma	8	.19	3	.07					3	.13	3	.12		
Pulmonary emphysema	19	.45	1	.02					6	.25		.24		.04
Other diseases of the respiratory system, pneumonia excepted	4,796	113.48	38	.90	27	.64	129	82.64	1,433	60.17	1,562	61.55	4	.16
Total respiratory system														.35
V. DISEASES OF THE DIGESTIVE SYSTEM.														
Diseases of the salivary glands and ducts	1	.02												
Diseases of the teeth, gums, and alveoli	335	7.93	4	.09	22	14.00			218	9.15	240	9.46		
Diseases of the mouth and tongue	60	1.42			6	3.84			43	1.81	49	1.93		
Tonsillitis	2,519	59.60			39	24.98			331	13.90	370	14.58		
Other diseases of the pharynx	804	19.02			14	8.97			91	3.82	105	4.14		
Diseases of the esophagus			2	.05										
Ulcer of the stomach	2	.05												
Dyspepsia	1,419	33.57	1	.02	166	106.34			1,021	42.87	1,187	46.77		.04
Gastritis	558	13.20	7	.17	23	14.73			784	30.82	757	29.83		
Other diseases of the stomach, except cancer	17	.40	2	.05	1	.64			31	1.30	32	1.26		.04

TABLE V.—Admissions to sick report, discharges, and deaths in the Army at home and on insular service, with ratios per 1,000 of mean strength for the year 1903—Continued.

Mean strength	United States (continental)						Cuba and Porto Rico.						Pacific Islands and China.						Total Islands.					
	42,264			1,561			23,818			25,879			23,818			25,879			23,818			25,879		
	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.	Admissions.	Dis-	Deaths.
	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.	Number.	Ratio.	Number.
V. DISEASES OF THE DIGESTIVE SYSTEM—continued.																								
Diarrhea:																								
Acute	2,423	57.33		119	76.24		5,018	210.69		1	0.04		5,018	210.69		1	0.04		5,018	210.69		1	0.04	
Chronic	82	1.94	6 0.14	2	1.26		109	4.58		2	.08		109	4.58		2	.08		109	4.58		2	.08	
Enteritis	268	6.34	21 .50	13	8.33	1 0.64	459	19.27		5	.21		459	19.27		5	.21		459	19.27		5	.21	
Intestinal parasites	60	1.42		2	1.28		75	3.15					75	3.15					75	3.15				
Inguinal hernie	160	3.79	43 1.02	6	3.84	2 1.28	60	2.52					60	2.52					60	2.52				
Other hernie	13	.31	6 .14				6	.25					6	.25					6	.25				
Intestinal obstruction	4	.09		1	.64		3	1.13					3	1.13					3	1.13				
Fistula in ano	36	.85				2 .05	27	1.13					27	1.13					27	1.13				
Other diseases of the intestines	1,219	28.84	7 .17	39	24.99		1,101	46.23		1	.04		1,101	46.23		1	.04		1,101	46.23		1	.04	
Acute yellow atrophy of the liver	3	.07					1	.04					1	.04					1	.04				
Cirrhosis of the liver	14	.33					2	.08					2	.08					2	.08				
Biliary calculi	17	.40					5	.21					5	.21					5	.21				
Acute hepatitis	12	.28		2	1.28		1	.04					1	.04					1	.04				
Hepatic abscess	93	2.20					13	.55					13	.55					13	.55				
Jaundice, catarrhal	12	.28					7	.29					7	.29					7	.29				
Other diseases of the liver	39	.92	1 .02	3	1.92	9 .21	75	3.15		3	.13		75	3.15		3	.13		75	3.15		3	.13	
Diseases of the spleen	4	.09		1	.64		10	.42					10	.42					10	.42				
Simple peritonitis	6	.14	1 .02				2	.08					2	.08					2	.08				
Appendicitis and abscesses of iliac fossa	142	3.36	5 .12	3	1.92	6 .14	63	2.65		2	.08		63	2.65		2	.08		63	2.65		2	.08	
Other diseases of the digestive system, cancer and tuberculosis excepted	2	.05	2 .05				2	.08					2	.08					2	.08				
Total digestive system	10,312	243.99	109 2.58	462	295.97	8 1.92	9,507	399.15		21	.88		9,507	399.15		21	.88		9,507	399.15		21	.88	

VI. DISEASES OF THE GENITO-URINARY SYSTEM AND ITS ADJEXA

Acute nephritis.....	37	.64	1	.02	2	.05				25	1.05	2	.08	25	.99			2	.04
Bright's disease.....	30	.71	14	.33	11	.26				24	1.01	3	.13	24	.95			3	.12
Pyelitis and pyelonephritis.....	7	.17	2	.05	1	.02				2	.08			2	.08				
Other diseases of the kidneys.....	16	.38								8	.34			8	.32				
Renal calculi.....	5	.12								20	.84			22	.87				
Vesical calculi.....	1	.02								1	.04			1	.04				
Cystitis.....	74	1.75	1	.02	3	1.92				47	1.97			50	1.97				
Other diseases of the bladder.....	46	1.09	10	.24	4	2.56	1	.64		19	.80			23	.91	1	.04		
Stricture of the urethra.....	56	1.33			2	1.28				27	1.13			29	1.14				
Other diseases of the urethra.....	19	.45	.45	.64	1	.64	1	.64		10	.42			11	.43	1	.04		
Prostatitis.....	5	.12								4	.17			4	.16				
Prostatic hypertrophy.....										1	.04			1	.04				
Balanitis, nongonorrheal.....	30	.71			1	.64				12	.50			13	.51				
Paraphimosis.....	7	.17								15	.50			15	.50				
Phimosis.....	99	2.34			14	8.97				98	4.11			112	4.41				
Hydrocele.....	29	.69	2	.05	7	4.48				24	1.01			31	1.22				
Orchitis, nonvenereal.....	49	1.16	1	.02	5	3.20				40	1.08			45	1.77				
Other nonvenereal diseases of the genital organs.....	113	2.67	4	.09	13	8.33				84	3.53			97	3.82				
Total genito-urinary system and its adnexa.....	613	14.50	35	.83	14	.33				451	18.94	5	.21	503	19.82	2	.08	5	.20

VIII. DISEASES OF THE SKIN AND CELLULAR TISSUE.

Gangrene.....	1	.02	1	.02						1	.04	1	.04	1	.04			1	.04
Furuncle.....	65	1.94								24	1.01			30	1.18				
Acute abscess, phlegmon.....	1,273	30.12								1,101	46.25			1,169	45.67				
Adenitis, suppurative (nonvenereal).....	605	14.97	1	.02	58	37.16				682	26.34			692	27.27				
Acute lymphadenitis, suppurative.....	41	.05			4	2.56				55	2.31			59	2.32				
Boils and warts.....	180	4.26	2	.05	16	10.35				72	3.02			88	3.47				
Ingrowing nail.....	182	3.12			13	8.33				190	7.36			203	8.00				
Cliban.....	4	.09																	
Ulcera.....	140	3.31	6	.14	12	7.69				355	14.90			397	14.46				
Dermatitis from poisonous plants.....	198	4.68			32	20.50				33	1.39			65	2.56				
Erythema.....	50	1.18			10	6.41				41	1.72			51	2.03				
Herpes.....	122	2.89			6	3.84				58	2.44			64	2.52				
Eczema and pemphigus.....	283	6.22			46	29.47	1	.64		216	9.07			262	10.32	1	.04		
Impetigo and acne.....	20	.47			1	.64				46	1.93			47	1.85				
Urticaria.....	55	1.30			5	3.20				18	.76			23	.91				
Scabies.....	172	4.07			2	1.28				10	.42			12	.47				
Dhobie itch.....	52	1.25			4	2.56				468	19.65			472	18.60				
Other diseases of the skin and its adnexa.....	332	7.86	2	.05	21	13.45				280	11.75			301	11.86				
Total skin and cellular tissue.....	3,707	87.71	13	.31	296	189.63	1	.64		3,601	151.19	2	.08	3,897	153.55	1	.04	2	.08

TABLE V.—Admissions to sick report, discharges, and deaths in the Army at home and on insular service, with ratios per 1,000 of mean strength for the year 1903—Continued.

Mean strength	United States (continental).						Cuba and Porto Rico.						Pacific Islands and China.						Total Islands.					
	42,264						1,561						23,818						25,379					
	Admissions.		Discharges.		Deaths.		Admissions.		Discharges.		Deaths.		Admissions.		Discharges.		Deaths.		Admissions.		Discharges.		Deaths.	
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
IX. DISEASES OF THE ORGANS OF LOCOMOTION.																								
Osteomyelitis	1	0.02	1	0.02	.....	.....	.....	.....	.....	.....	.....	.....	3	0.13	.....	.....	.....	.....	3	0.12	.....	.....	.....	.....
Caries and necrosis of bone, non-tubercular	9	.21	3	.07	.....	.....	.....	.....	.....	.....	.....	.....	9	.38	.....	.....	.....	.....	9	.33	.....	.....	.....	.....
Periostitis	44	1.04	2	.05	.....	.....	2	1.28	.....	.....	.....	.....	17	.71	.....	.....	.....	.....	19	.76	.....	.....	.....	.....
Other non-tubercular diseases of the bones	34	.80	13	.31	.....	.....	2	1.28	1	0.64	.....	.....	14	.59	.....	.....	.....	.....	16	.63	1	0.04	.....	.....
Arthritis	73	1.73	7	.17	.....	.....	4	2.56	.....	.....	.....	.....	28	1.18	.....	.....	.....	.....	32	1.26	.....	.....	.....	.....
Bunion	31	.73	5	.12	.....	.....	3	1.92	.....	.....	.....	.....	8	.34	.....	.....	.....	.....	11	.43	.....	.....	.....	.....
Synovitis	129	3.05	13	.31	.....	.....	2	1.28	.....	.....	.....	.....	40	1.68	.....	.....	.....	.....	42	1.65	.....	.....	.....	.....
Other diseases of the joints, except tuberculosis and rheumatism	76	1.80	25	.59	.....	.....	2	1.28	.....	.....	.....	.....	25	1.05	1	0.04	.....	.....	27	1.06	1	.04	.....	.....
Muscular rheumatism and myalgia	1,514	35.82	9	.21	.....	.....	72	46.13	.....	.....	.....	.....	715	30.02	.....	.....	.....	.....	787	31.01	.....	.....	.....	.....
Other diseases of the organs of locomotion	83	1.96	14	.33	.....	.....	.....	.....	.....	.....	.....	.....	33	1.39	1	.04	.....	.....	33	1.30	1	.04	.....	.....
Total organs of locomotion	1,994	47.18	92	2.18	.....	.....	87	55.73	1	.64	.....	.....	892	37.45	2	.08	.....	.....	979	38.57	3	.12	.....	.....
XII. OLD AGE.																								
Senile debility	2	.05	1	.02	.....	.....	.....	.....	.....	.....	.....	.....	1	.04	.....	.....	.....	.....	1	.04	.....	.....	.....	.....
XIV. ILL-DEFINED DISEASES.																								
Malingering	54	1.28	.....	.....	.....	.....	1	.64	.....	.....	.....	.....	14	.59	.....	.....	.....	.....	15	.59	.....	.....	.....	.....
Under observation, undiagnosed, and unknown	197	4.66	.....	.....	3	.07	16	10.25	.....	.....	.....	.....	63	2.65	.....	.....	1	0.04	79	3.11	.....	.....	1	0.04
Total ill-defined diseases	251	5.94	.....	.....	3	.07	17	10.89	.....	.....	.....	.....	77	3.23	.....	.....	1	.04	94	3.70	.....	.....	1	.04
Total for disease	40,637	961.50	1,382	32.70	174	4.12	1,938	1,241.51	30	19.22	21	28.40	4,621	1,701.28	50	2.10	299	12.55	42,456	1,673.00	80	3.15	301	11.86

XIII. EXTERNAL CAUSES.

XIII. EXTERNAL CAUSES.																								
Suicide:																								
By poison.....	2	.05			4	.09		1	.04	2	.08	1	.04	2	.08									
By hanging or strangulation.....					1	.02																		
By drowning.....					11	.26		2	.08	11	.46	2	.08	11	.43									
By firearms.....	1	.02																						
By cutting instruments.....					2	.05																		
Fractures, exclusive of gunshot.....	441	10.43	23	.54	11	.26	10	6.41																
Dislocations.....	27	4.12	3	.07	2	.05	4	2.56																
Strains.....	174	62.68	8	.19			74	47.40	1	.64														
Strain, muscular.....	2,649	62.68					23	14.73																
Abrasions and blisters (mechanical).....	577	13.52					26	16.66																
Compression of brain.....	6	.14			1	.02																		
Concussion of brain.....	19	.45					4																	
Concussion of spine.....	2	.05			1	.02	3																	
Wounds:																								
Contused.....	431	10.20					22	14.09																
Incised.....	718	16.99	12	.28			66	42.28																
Lacerated.....	711	16.82	8	.19			39	24.98																
Punctured.....	310	7.33	1	.02			16	10.25																
Gunsnot.....	99	2.35	45	1.06	12	.28	1	.64																
Crushing.....	2	.05	1	.02																				
Other traumas.....	3,108	73.54	12	.28	11	.26	122	78.15																
Burns and scalds.....	217	5.13					6	3.84																
Burns by corrosive substances.....	13	.31					1	.64																
Sunstroke.....	56	1.33					11	7.05																
Frostbite.....	49	1.16	3	.07																				
Electric shock.....																								
Drowning.....	8	.07			13	.31																		
Absorption of deleterious gases.....	4	.09			1	.02																		
Narcotic poisonings, acute.....	5	.12			3	.07	1	.64																
Corrosive and irritant poisonings, acute.....	44	1.01					8	5.12																
Venomous bites, stings, and wounds.....	30	.71			1	.02	13	8.33																
Other acute poisonings.....	22	.52					1	.64																
Exhaustion from fatigue and exposure.....	2	.05																						
Suffocation, exclusive of disease.....	20	.47			1	.02	2	1.28																
Foreign bodies, presence of.....																								
Homicide.....																								
Killed in battle.....																								
Total external causes.....																								
	10,371	245.39	116	2.74	77	1.82	446	285.72	1	.64	1	.64	4,246	178.27	3	.13	76	3.19	4,692	184.88	4	.16	77	3.03
Grand total.....																								
	51,008	1,206.89	1,498.85	44	251	5.94	2,384	1,527.23	31	1.86	31	1.92	44,767	1,879.54	53	2.23	375	15.74	47,151	1,857.87	84	3.31	378	14.98

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army by Arms of Service, with ratios per 1,000 of mean strength for the year 1903.

Mean strength.....	Infantry.						Cavalry.						Field Artillery.					
	25,925			12,562			3,581											
	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.
Causes of admission to sick report.																		
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
I.—GENERAL DISEASES.																		
a. Epidemic diseases.																		
Typhoid fever.....	114	4.40	17	0.66	109	8.68	7	0.56	23	6.51	1	0.28	216	61.18	1	0.28	216	61.18
Malarial fever.....	5,478	211.29	1	.04	2,155	171.55	2	.16	19	5.38	4	.32	41	11.61	1	0.28	41	11.61
Intermittent.....	761	29.35	11	.42	610	48.56	4	.32	19	5.38	4	.32	41	11.61	1	0.28	41	11.61
Fernicious.....	16	.62	1	.04	6	.48	1	.08	4	1.13	1	.08	2	.57	1	0.28	2	.57
Malarial cachexia.....	143	5.52	2	.08	51	4.06	1	0.08	4	1.13	1	.08	4	1.13	1	0.28	4	1.13
Smallpox.....	18	.69	2	.08	5	.40	1	.08	4	1.13	1	.08	4	1.13	1	0.28	4	1.13
Measles.....	130	5.01	2	.08	69	5.49	1	.08	4	1.13	1	.08	4	1.13	1	0.28	4	1.13
Scarlet fever.....	3	.12	1	.04	2	.16	1	.08	1	.08	1	.08	1	.08	1	0.28	1	.08
Diphtheria.....	12	.46	1	.04	5	.40	1	.08	1	.08	1	.08	1	.08	1	0.28	1	.08
Influenza.....	767	29.58	58	2.24	279	22.21	7	.56	138	39.08	2	.16	138	39.08	2	.16	138	39.08
Asiatic cholera.....	86	3.32	1	.04	10	.80	1	.08	1	.08	1	.08	1	.08	1	0.28	1	.08
Cholera nostras.....	22	.85	20	.77	9	.72	6	.48	41	11.61	1	.08	41	11.61	1	0.28	41	11.61
Acute dysentery.....	1,112	42.89	47	1.81	310	24.68	3	.24	17	4.81	4	1.13	17	4.81	4	1.13	17	4.81
Chronic dysentery.....	476	18.36	11	.42	160	11.94	15	1.19	3	.24	4	1.13	1	.08	1	0.28	4	1.13
Yellow fever.....	5	.19	1	.04	6	.48	1	.08	5	1.42	1	.08	5	1.42	1	0.28	5	1.42
Erysipelas.....	26	1.00	3	.12	6	.48	1	.08	5	1.42	1	.08	5	1.42	1	0.28	5	1.42
Beri-beri.....	15	.58	3	.12	3	.24	1	.08	3	.81	1	.08	3	.81	1	0.28	3	.81
Dengue.....	1,206	46.52	1	.04	608	48.40	1	.08	112	31.72	1	.08	112	31.72	1	0.28	112	31.72
Mumps.....	206	7.95	83	3.22	83	6.56	2	.16	46	13.03	9	2.55	46	13.03	9	2.55	46	13.03
Rubella.....	15	.58	2	.08	2	.16	1	.08	9	2.55	1	.08	9	2.55	1	0.28	9	2.55
Varicella.....	13	.50	3	.12	3	.24	1	.08	2	.57	1	.08	2	.57	1	0.28	2	.57
Vaccinia.....	493	19.02	246	9.58	246	19.58	19	1.58	92	26.06	1	.08	92	26.06	1	0.28	92	26.06
Total for epidemic diseases.....	11,117	428.80	52	2.01	4,691	373.44	17	1.35	31	2.47	772	218.64	4	1.13	2	.57	772	218.64

b. Other general diseases.

b. Other general diseases.																			
Purulent infection and septicoemia	4	.15					4	.15											
Anthrax	13	.50							1	.08									
Typhoid fever, typhus, etc.	57	3.36	71	2.74	.62	37	2.95	.25	1.99	6	.48	14	3.96	8	2.27	1	.85		
Tuberculosis of the lungs	8	.12	1	.04		1	.08												
Abscesses	3	.12	1	.04		1	.08												
Actinomyces tuberculosis	3	.12	1	.04		1	.08												
Pyothoracic abscess	6	.23	2	.08	2	.08	3	.24	2	.16	1	.08							
"White swelling"	8	.12																	
"Tuberculous nodes of other organs."	8	.12																	
Syphilis:																			
Primary	91	3.51					50	3.98						13	3.68				
Secondary	548	21.14	88	3.39		344	27.39	40	3.18					70	19.83	7	1.98		
Tertiary	45	1.74	6	.23	1	.04	19	1.51	5	.40				2	32.57	1	.28	1	.28
Chancroid	1,023	39.46	2	.08		517	41.16							115	82.57				
Gonorrhea	2,340	90.36	2	.08		1,426	113.62	7	.56					294	83.26	6	1.42		
Gonorrheal epididymitis and orchitis	384	14.81	1	.04		187	14.88	2	.16					43	12.18	1	.57		
Gonorrheal ophthalmia	8	.31	5	.23	8	.31	7	2.56	2	.16				2	12.57	2	.57		
Gonorrheal rheumatism	62	2.39	20	.77		36	2.87	11	.88					6	1.70	2	.57		
Cancer and other malignant tumors:																			
Of the buccal cavity	1	.04				1	.08							1	.28	1	.28		
Of the stomach, liver	3	.12																	
Of the peritoneum, intestines, rectum	2	.08																	
Cancer and other malignant tumors of other organs and unspecified	4	.15	2	.08															
Other tumors	34	1.31	1	.04		13	1.03							4	1.13				
Acute articular rheumatism	252	9.72				129	10.27	1	.08					36	10.20				
Chronic rheumatism and gout	160	5.79	19	.73		80	6.37	10	1.19					18	6.10	3	.85		
Scurvy	4	.15																	
Diabetes	5	.19	3	.12															
Exophthalmic goiter	1	.04												1	.28				
Leukemia	27	.99				13	1.03							5	1.42	1	.28		
Other general diseases	337	13.77	2	.08		253	20.14	1	.08					22	6.23	1	.28		
Acute alcoholism	643	24.80				178	13.77							41	11.93			1	.28
Delirium tremens	29	1.12	1	.04		8	.64							3	.85				
Chronic alcoholism	35	1.35	3	.12	2	.08	8	.64	2	.16				3	.85				
Chronic lead poisoning	1	.04																	
Narcotic poisonings, chronic	3	.12																	
Other chronic poisonings	1	.04												1	.28				
Total for other general diseases	6,162	237.08	228	8.79	37	1.43	3,313	263.74	116	9.23	9	.72	693	195.27	33	9.34	6	1.70	

Total for other general diseases.

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army by Arms of Service, with ratios per 1,000 of mean strength for the year 1903—Continued.

	Infantry.						Cavalry.						Field Artillery.					
	25,926			12,562			3,531											
	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.
Causes of admission to sick report.																		
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE.																		
Mean strength.....	25,926	12,562	3,531	25,926	12,562	3,531	25,926	12,562	3,531	25,926	12,562	3,531	25,926	12,562	3,531	25,926	12,562	3,531
Meningitis.....	1	0.04	1	0.04	5	0.40	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08
Encephalitis, epidemic, cerebro-spinal.....	1	0.04	1	0.04	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08
Encephalitis, epidemic, cerebro-spinal.....	1	0.04	1	0.04	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08	1	0.08
Other diseases of the spinal cord.....	4	15	2	0.08	6	23	1	0.04	2	0.08	6	23	1	0.04	2	0.08	6	23
Cerebral congestion and hemorrhage.....	6	23	1	0.04	6	23	1	0.04	6	23	1	0.04	6	23	1	0.04	6	23
Softening of the brain.....	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04
Paralysis without specified cause.....	16	62	3	12	1	0.04	7	24	1	0.08	7	24	1	0.08	7	24	1	0.08
General paralysis.....	28	108	27	1.04	10	80	10	80	9	72	1	0.08	4	1.13	3	85	1	0.28
Insanity.....	37	143	13	50	17	1.35	17	1.35	11	88	2	0.57	2	0.57	2	0.57	2	0.57
Epilepsy.....	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04
Convulsions (eclampsia).....	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04
Tetanus.....	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04
Chorea.....	283	10.92	1	0.04	155	24	1	0.08	155	24	1	0.08	29	8.21	1	0.28	1	0.28
Neuralgia.....	42	1.62	10	39	15	1.19	2	1.19	2	1.19	2	1.19	6	1.70	1	0.28	1	0.28
Neuritis.....	44	1.70	4	15	20	1.59	2	1.59	2	1.59	2	1.59	6	1.70	1	0.28	1	0.28
Neurasthenia.....	5	1.19	1	0.08	96	7.64	5	40	17	4.81	5	40	17	4.81	5	40	17	4.81
Notalgia.....	148	5.71	17	66	1	0.04	96	7.64	5	40	17	4.81	17	4.81	5	40	17	4.81
Other diseases of the nervous system.....	618	23.84	79	3.05	331	26.35	331	26.35	37	2.95	2	1.16	60	16.99	12	3.40	12	3.40
Total for nervous system.....	618	23.84	79	3.05	331	26.35	331	26.35	37	2.95	2	1.16	60	16.99	12	3.40	12	3.40
Of the eye and its adnexa.																		
Lids, diseases of.....	40	1.54	2	0.08	14	1.11	14	1.11	3	24	3	24	9	2.55	3	85	3	85
Lachrymal apparatus, diseases of.....	2	0.08	2	0.08	3	24	3	24	3	24	3	24	9	2.55	3	85	3	85
Conjunctivitis.....	217	8.37	2	0.08	126	10.08	126	10.08	2	16	2	16	35	9.91	1	0.28	35	9.91
Acute.....	15	58	2	0.08	9	72	9	72	2	16	2	16	3	85	1	0.28	3	85
Chronic.....	12	46	1	0.04	2	16	2	16	2	16	2	16	3	85	1	0.28	3	85
Keratitis.....	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04	1	0.04
Choroid, diseases of.....	26	1.00	2	0.08	12	0.95	12	0.95	7	56	7	56	2	1.57	2	1.57	2	1.57
Iritis.....	16	62	2	0.08	7	56	7	56	1	0.08	1	0.08	4	1.13	1	0.28	4	1.13
Snow-blindness.....	2	0.08	2	0.08	1	0.08	1	0.08	1	0.08	1	0.08	2	1.57	2	1.57	2	1.57
Asthenopia.....	4	15	1	0.04	2	16	2	16	1	0.08	1	0.08	2	1.57	2	1.57	2	1.57

[illegible]

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army by Arms of Service, with ratios per 1,000 of mean strength for the year 1903—Continued.

Mean strength	Infantry.						Cavalry.						Field Artillery.			
	25,928			12,562			3,831									
	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Ratio.
Causes of admission to sick report.																
IV. DISEASES OF THE RESPIRATORY SYSTEM—continued.																
Pulmonary emphysema	7	0.27		2	0.16											
Other diseases of the respiratory system, phthisis excepted	11	.42		3	.24								1	0.28		
Total for the respiratory system	2,348	90.57	16	.62	13	0.50	1,113	88.61	7	0.56	7	0.56	427	120.93	2	0.57
V. DISEASES OF THE DIGESTIVE SYSTEM.																
Diseases of the salivary glands and ducts	1	.04														
Diseases of the teeth, gums, and alveoli	252	9.72					102	8.12					31	8.78		
Diseases of the mouth and tongue	47	1.81					27	2.15					1	.80		
Tonsillitis	962	37.10					684	54.40					283	70.80		
Other diseases of the pharynx	239	9.22					187	14.86					74	20.96		
Diseases of the esophagus	1	.04					1	.08								
Liver of the stomach	956	36.87					525	41.79					152	43.05	1	.28
Dyspepsia	582	22.81	1	.04	1	.04	271	21.57	3	.24	1	.08	68	17.84	1	.28
Other diseases of the stomach, except cancer	21	.81	1	.04			7	.56					5	1.42		
Diarrhea	3,980	151.82					1,476	117.50					370	104.79		
Cholera	121	4.67	4	.15			29	2.31					7	1.98		
Enteritis	371	14.31	11	.42	9	.35	183	14.57	4	.32	2	.16	36	10.20	1	.28
Intestinal parasites	77	2.97					30	2.39					2	.57		
Inguinal hernia	92	3.55	18	.69			37	2.95	10	.80			10	2.83	2	.57
Other hernia	8	.31	3	.12			1	.08	1	.08			1	.28		
Intestinal obstruction	2	.08											2	.57		
Fistula in ano	30	1.16			1	.04	13	.96					6	1.70		
Other diseases of the intestines	1,026	39.58	3	.12			476	37.89	1	.08			101	28.60		
Acute yellow atrophy of the liver	1	.04														
Cirrhosis of the liver	3	.12														
Biliary calculi	7	.27					1	.08								
Acute hepatitis	11	.42					4	.32					1	.28		

	22	85	10	80	1,42
Malingering.....	1	01			
(Under observation, undiagnosed, and unknown)	117	4,51	10,946	3,348,09	3,124,01
Total ill-defined disease	38,437	1,366,86	10,946	3,348,09	3,124,01
Total for disease					
XIII. EXTERNAL CAUSES.					
Suicide:					
By poison.....	1	01			
By hanging or strangulation.....					
By drowning.....					
By firearms.....					
By cutting instruments.....					
Fractures, exclusive of gunshot.....	202	7,79	11,01	11,000	11,110
Dislocations.....	68	2,62	81	6,15	7,30
Strains, muscular.....	1,217	46,94	909	72,37	71,91
Strains, ligamentary.....	220	8,40	290	23,29	23,11
Abrasions and blisters (mechanical).....	337	13,00	271	21,58	20,11
Compression of brain.....	2	08	2	1,10	1,00
Concussion of brain.....	12	16	12	96	18,00
Concussion of spine.....			1	08	
Wounds:					
Contused.....	240	9,26	166	12,18	17,81
Inclined.....	511	19,71	237	18,87	17,27
Lacerated.....	367	14,16	273	21,74	20,00
Punctured.....	158	6,09	87	6,93	11,00
Gunshot.....	68	2,24	73	5,81	3,00
Crushing.....	1,102	42,60	1,304	108,76	108,97
Other traumas.....	119	4,50	64	6,10	17,81
Burns and scalds.....	6	23	3	24	1,81
Burns by corrosive substances.....	79	3,05	63	5,02	7,77
Gunstroke.....	21	81	19	1,51	3,85
Frostbite.....	1	04			
Electric shock.....					
Drowning.....	1	04			
Absorption of deleterious gases.....	3	12	1	09	
Narcotic poisonings, acute.....	4	15	13	3,18	4,42
Corrosive and irritant poisonings, acute.....	74	2,85	40	1,94	2,77
Venomous bites, stings, and wounds.....	79	3,05	7	1,66	
Other acute poisonings.....	22	85	1	08	
Exhaustion from fatigue and exposure.....			4	32	
Suffocation, exclusive of disease.....	6	23	1	09	85
Foreign bodies, presence of.....	2	08			
Homicide.....					
Killed in battle.....					
Total external causes.....	4,913	189,48	4,152	329,73	365,34
Grand total.....	40,350	1,556,35	21,098	1,678,72	1,489,94

	5	.38								2	2.69	
Tuberculosis of other organs												
<i>Syphilis</i>												
Primary	44	3.32										
Secondary	213	16.08	84	2.57								
Tertiary	17	1.28	7	.53								
Hereditary												
Chancroid	341	25.75										
Gonorrhea	870	65.69	6	.45								
Gonorrheal epididymitis and orchitis	148	11.17	5	.38								
Gonorrheal ophthalmia	3	.23										
Gonorrheal rheumatism	40	3.02	14	1.06								
Cancer and other malignant tumors:												
Of the buccal cavity												
Of the stomach, liver	1	.08										
Of other organs and unspecified	1	.08										
Other tumors	21	1.59	1	.08								
Acute articular rheumatism	136	10.27										
Chronic articular rheumatism and gout	57	4.30	14	1.06								
Diabetes												
Addison's disease												
Anemia	11	.83	1	.08								
Other general diseases	169	12.76	1	.08								
Acute alcoholism	551	41.60										
Delirium tremens	13	.98										
Chronic alcoholism	18	1.36	2	.15								
Chronic lead poisoning	2	.15										
Various poisonings, chronic	3	.23	1	.08								
Other chronic poisonings												
Total for other general diseases	2,717	205.15	123	9.29	9	.68	261	196.24	11	8.27	3	2.26
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE.												
Meningitis	1	.08										
Encephalitis, epidemic, cerebro-spinal	1	.08										
Progressive locomotor ataxia	1	.08										
Other diseases of the spinal cord	3	.23										
Cerebral congestion and hemorrhage	3	.23	2	.15								
Paralysis without specified cause	17	1.28	17	1.28								
General paralysis	20	1.51	9	.68								
Epilepsy	1	.08										
Chorea	1	.08										
Neuritis	175	13.21	3	.23								
Neuralgia	93	7.06	9	.68								
Neuritis	18	1.36	3	.23								
Neurasthenia	2	.15										
Neuralgia	83	6.27	6	.45								
Other diseases of the nervous system												
Total	355	26.80	44	3.32	3	.23	31	23.31	2	1.50	1	.08

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army by Arms of Service, with ratios per 1,000 of mean strength for the year 1903—Continued.

Mean strength.....	Coast Artillery.				Engineers.				Ordnance.			
	13,244				1,330				743			
	Admissions.	Discharges.	Deaths.	Ratio.	Admissions.	Discharges.	Deaths.	Ratio.	Admissions.	Discharges.	Deaths.	Ratio.
Cause of admission to sick report.	Number.	Number.	Number.	Ratio.	Number.	Number.	Number.	Ratio.	Number.	Number.	Number.	Ratio.
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE—continued.												
<i>Of the eye and its adnexa.</i>												
Lids, diseases of.....	19	1.43	.....	.....	2	1.50	.....	.....	.....	.....	.....	.....
Lachrymal apparatus, diseases of.....	3	.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Conjunctivitis:												
Acute.....	106	8.00	.....	.....	7	5.26	.....	.....	5	6.73	.....	.....
Chronic.....	11	.83	2	0.15	.....	.....	.....	.....	.....	.....	.....	.....
Keratitis.....	7	.53	.....	.....	1	.75	.....	.....	.....	.....	.....	.....
Choroid, diseases of.....	1	.08	.....	.....	.....	.....	.....	.....	1	1.35	.....	.....
Iritis.....	1	.08	1	.08	.....	.....	.....	.....	.....	.....	.....	.....
Retinitis.....	8	.60	.....	.....	2	1.50	.....	.....	.....	.....	.....	.....
Snow-blindness.....	8	.60	3	.23	.....	.....	.....	.....	.....	.....	.....	.....
Other diseases of the eye and its adnexa.....	2	.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Of the ear and its adnexa.</i>												
Asthenopia.....	2	.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cataract.....	2	.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amaturosis.....	3	.23	4	.30	.....	.....	.....	.....	.....	.....	.....	.....
Other diseases of the eye and its adnexa.....	32	2.42	3	.23	4	3.01	.....	.....	1	1.35	.....	.....
Total for the eye and its adnexa.....	202	15.25	15	1.13	16	12.03	3	2.26	7	9.42	.....	.....
<i>Of the ear and its adnexa.</i>												
Diseases of the external ear.....	17	1.28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Diseases of the tympanum.....	1	.08	.....	.....	.....	.....	.....	.....	1	1.35	.....	.....
Diseases of the middle and internal ear.....	80	6.04	6	.45	10	7.62	1	.75	5	6.73	.....	.....
Deafness.....	12	.93	.....	.....	1	.75	.....	.....	.....	.....	.....	.....
Other diseases of the ear and its adnexa.....	11	.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total for the ear and its adnexa.....	111	8.38	6	.45	12	9.02	2	1.50	6	8.08	.....	.....

III. DISEASES OF THE CIRCULATORY SYSTEM.

	1	0.08	17	1.28	2	0.15	1	0.75	1	0.75	1	1.35
Acute endocarditis	1	0.08										
Organic diseases of the heart	21	1.59										
Angina pectoris	6	.45										
Cardiac irritability	28	2.11	1	.08			5	3.76	2	1.50		
Aneurism	1	.08			1	.08						
Other diseases of the arteries	2	.15										
Embolism and thrombosis	2	.15										
Varicose veins	79	5.96	1	.08			6	4.51				
Hemorrhoids	18	1.36					2	1.50			1	1.35
Phlebitis	116	8.76					11	8.27			2	2.69
Adenitis, nonsuppurative (nonvenereal)	4	.30	1	.08								
Lymphangitis	9	3.70					3	2.26				
Other diseases of the lymphatic system	9	.68										
Hemorrhages	16	1.21										
Other diseases of the circulatory system	4	.30	1	.08			1	.75				

IV. DISEASES OF THE RESPIRATORY SYSTEM.

	405	30.58			21	15.79		38	51.15	
Coryza										
Chronic nasal catarrh	28	2.11			1	.75				
Nasal polypus	2	.15								
Other diseases of the nasal fosse						.75				
Diseases of the larynx	68	4.38	1	.08	13	9.77		3	4.04	
Diseases of the thyroid body	2	.15	1	.08		.75				
Acute bronchitis	1,008	76.11			66	49.62				
Chronic bronchitis	67	4.30			2	1.50		32	43.07	
Broncho-pneumonia	2	.15			1	.75				
Pneumonia	38	2.41			9	6.77		1	1.35	
Pleurisy	38	2.47	2	.15	5	3.76		2	2.69	
Congestion and apoplexy of the lungs										
Asthma	1	.08			2	1.50				
Pulmonary emphysema	24	1.81	4	.30						
Other diseases of the respiratory system,	2	.15								
phtisis excepted	9	.68	1	.08						

V. DISEASES OF THE DIGESTIVE SYSTEM.

Diseases of the teeth, gums, and alveoli.....	141	10.65	1	.08	8	6.02		3	4.04
Diseases of the mouth and tongue.....	235	17.74			43	32.33		14	18.84
Tonsillitis.....	749	56.05			137	103.34		7	9.42
Other diseases of the pharynx.....	313	23.68			47	35.34			
Dysphagia.....	1	.07					1	.75	
Dyspepsia.....	691	52.17			45	33.84		30	40.98
Gastritis.....	194	14.65			24	18.04		8	10.77
Other diseases of the stomach, except cancer.....	4	.30							

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Drowning.....	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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TABLE VI.—Admissions to sick report, discharges, and deaths in the Army, by arms of service, with ratios per 1,000 of mean strength, for the year 1903—Continued.

Signal Corps.		Medical Department.			Philippine Scouts.			Others.			
810		3,369			4,888			1,240			
Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.	Admissions.	Discharges.	Deaths.
Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
Causes of admission to sick report.											
I. GENERAL DISEASES.											
a. Epidemic diseases.											
Typhoid fever											
Malarial fever:											
Intermittent											
Remittent or continued											
Perilicious											
Malarial cachexia											
Smallpox											
Measles											
Scarlet fever											
Diphtheria											
Influenza											
Asiatic cholera											
Cholera nostrus											
Acute dysentery											
Chronic dysentery											
Erysipelas											
Beri-beri											
Dengue											
Mumps											
Rubella											
Varicella											
Vaccinia											
Total epidemic diseases											
b. Other general diseases.											
Purulent infection and septicemia											
Actinomycosis, trichinosis, etc.											

Tuberculois of the larynx						1	30	1	30	5.94	18	5.34									1	.81	1	.81
Tuberculois of the lungs						20	5.94	18	5.34	1	30	1	30								10	8.06	6	4.84
Tuberculois of other organs						1	30	1	30															
Syphilis:																								
Primary	7	8.64				3	89														1	.81		
Secondary	36	10.69				8	2.37														25	20.16	13	10.48
Tertiary	4	4.94				1	.80														2	1.61	1	.81
Chancroid	20	24.69				1	.80														19	15.82		
Gonorrhea	69	85.18				41	12.17														52	41.98		
Gonorrheal epididymitis and orchitis	111	32.95				111	32.94														11	8.87		
Gonorrheal ophthalmia	29	8.61				29	8.61														52	41.98		
Gonorrheal rheumatism	3	8.89				3	8.89														1	.81		
Cancer and other malignant tumors:																								
Of the stomach, liver	9	2.67				1	.80														5	4.03	1	.81
Of the peritoneum, intestines, rec-																								
tum																					1	.81		
Of other organs and unspecified																								
Other tumors																					1	.81	1	.81
Acute articular rheumatism	4	4.94																			14	11.29		
Chronic rheumatism and gout	6	7.41																			6	4.84	3	2.42
Scurvy	5	6.17	1.23																		1	.81		
Diabetes																								
Anemia	3	8.89																			2	1.61		
Other general diseases	1	1.23																			2	1.61		
Acute alcoholism	3	3.70																			13	10.48		
Delirium tremens	29	24.69																			18	14.81		
Chronic alcoholism	2	2.47																			1	.81		
Chronic lead poisoning																								
Chronic arsenic poisoning	1	1.23																			1	.81		
Narcotic poisonings, chronic																								
Total other general diseases	159	196.30	1.23	2.47	400	118.73	47	13.95	2	.59	610	124.79	31	6.34	9	1.84	186	150.00	27	21.77				
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE.																								
Meningitis																								
Progressive locomotor ataxia																					2	1.61	1	.81
Other diseases of the spinal cord																					1	.81		
Paralysis without specified cause																								
Insanity																					2	1.61	2	1.61
Epilepsy																					3	2.42	3	2.42
Tetanus																					3	2.42		
Neuralgia																								
Neuritis	6	7.41																			3	2.42		
Neurasthenia	7	2.08																			1	.81	1	.81
Other diseases of the nervous system	15	4.45																			4	3.23		
Total nervous system	5	6.17																			4	3.23		
	18	22.22	1.23																		2	.41	20	16.13
																					7	5.65		

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army, by arms of service, with ratios per 1,000 of mean strength, for the year 1903—Continued.

	Signal Corps.				Medical Department.				Philippine Scouts.				Others.			
	810				3,369				4,888				1,240			
Causes of admission to sick report.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.	Discharges.	Deaths.
II. DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE—continued.																
Of the eye and its adnexa.																
Idi. diseases of Lachrymal apparatus, diseases of Conjunctivitis:	2	2.47			4	1.19			2	0.41			2	1.61		
Acute					1	.30			2	.41			2	1.61		
Chronic	5	6.17			13	3.86			91	18.62			9	7.26		
Keratitis	1	1.23			3	.89			3	.61			3	2.42		
Iritis	1	1.23			4	1.19	1	0.30	11	2.25			3	2.42		
Retinitis	1	1.23			3	.89			2	.41	1	0.20	1	.81		
Snow-blindness	1	1.23			3	.89										
Asthenopia	2	2.47			2	.59										
Cataract																
Glaucoma																
Anaurosis					1	.30	1	.30	1	.20			1	.81		
Other diseases of the eye and its adnexa.	20	5.94	3	.89	20	5.94	3	.89	6	1.23	2	.41	9	7.26		
Total for the eye and its adnexa.	18	16.06			51	15.14	5	1.48	120	24.55	3	.61	26	20.97		
Of the ear and its adnexa.																
Diseases of the external ear.					3	.89			2	.41						
Diseases of the middle and internal ear.	3	3.70			13	5.34	2	.69	13	2.66			16	12.90	1	0.81
Deafness					1	.30	1	.30					1	.81		
Total for the ear and its adnexa.	3	3.70			22	6.53	3	.89	15	3.07			17	13.71	2	1.61

III. DISEASES OF THE CIRCULATORY SYSTEM.																							
Organic diseases of the heart.....	3	3.70		1	1.23	10	2.97	4	1.19	3	0.89	7	1.43	2	.41	4	0.82	16	12.90	11	8.87		
Angina pectoris.....	4	4.94				3	.89	1	.30			2	.41					2	1.61	1	.81	1	0.81
Cardiac irritability.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Embolism and thrombosis.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Varicose veins.....	1	1.23				16	4.75					1	.20					16	12.90	1	.81		
Varicose veins.....	2	2.47	.....	.....	.....	3	.89	1	.30	.....	.....	2	.41	.....	.....	.....	.....	9	7.26	.....	.....	.....	
Hemorrhoids.....	4	4.94	.....	.....	.....	24	7.12	1	.30	.....	.....	4	.82	.....	.....	.....	.....	2	1.61	1	.81	.....	
Phlebitis.....	.....	.....	.....	.....	.....	6	1.78	.....	.....	.....	.....	9	1.84	.....	.....	.....	.....	5	4.03	.....	.....	.....	
Adentis, nonsuppurative (nonvenereal).....	3	3.70	.....	.....	.....	3	.89	.....	.....	.....	.....	2	.41	.....	.....	.....	.....	1	.81	.....	.....	.....	
Lymphangitis.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Other diseases of the lymphatic system.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Hemorrhages.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Other diseases of the circulatory system.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Total circulatory system.....	17	20.99		1	1.23	68	20.18	7	2.08	3	.89	32	6.55	3	.61	4	.82	54	43.55	14	11.29	1	.81
IV. DISEASES OF THE RESPIRATORY SYSTEM.																							
Coryza.....	1	1.23	.....	.....	.....	36	10.69	.....	.....	.....	.....	57	11.66	.....	.....	.....	.....	18	14.52	.....	.....	.....	
Chronic nasal catarrh.....	1	1.23	.....	.....	.....	2	.59	1	.30	.....	.....	.....	.....	.....	.....	.....	.....	4	3.23	.....	.....	.....	
Other diseases of the nasal fossae.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Diseases of the larynx.....	.....	.....	.....	.....	.....	3	.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Acute bronchitis.....	15	18.52	.....	.....	.....	78	23.15	.....	.....	.....	.....	170	34.78	.....	.....	.....	.....	8	6.45	.....	.....	.....	
Chronic bronchitis.....	.....	.....	.....	.....	.....	13	3.86	.....	.....	.....	.....	9	1.84	.....	.....	.....	.....	80	64.52	.....	.....	.....	
Broncho-pneumonia.....	.....	.....	.....	.....	.....	2	.59	.....	.....	.....	.....	1	.20	.....	.....	.....	.....	3	2.42	.....	.....	.....	
Pneumonia.....	2	2.47	.....	.....	.....	9	2.67	.....	.....	.....	.....	20	4.09	.....	.....	.....	.....	11	8.87	.....	.....	.....	
Pleurisy.....	4	4.94	.....	.....	.....	17	5.05	1	.30	.....	.....	14	2.86	.....	.....	.....	.....	7	5.65	.....	.....	.....	
Congestion and apoplexy of the lungs.....	.....	.....	.....	.....	.....	2	.59	.....	.....	.....	.....	10	2.05	3	.61	1	.20	2	1.61	1	.81	.....	
Asthma.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Other diseases of the respiratory system, phthisis excepted.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Total respiratory system.....	23	28.40				162	48.09	2	.59			289	59.12	3	.61	4	.82	134	108.06	1	.81	3	2.42
V. DISEASES OF THE DIGESTIVE SYSTEM.																							
Diseases of the teeth, gums, and alveoli.....	6	7.41	.....	.....	.....	12	3.56	.....	.....	.....	.....	15	3.07	.....	.....	.....	.....	5	4.03	1	.81	.....	
Diseases of the mouth and tongue.....	12	12.17	.....	.....	.....	2	.59	.....	.....	.....	.....	2	.41	.....	.....	.....	.....	2	1.61	.....	.....	.....	
Tonsillitis.....	16	19.75	.....	.....	.....	103	30.97	.....	.....	.....	.....	18	3.68	.....	.....	.....	.....	50	40.33	.....	.....	.....	
Other diseases of the pharynx.....	3	3.70	.....	.....	.....	16	4.75	.....	.....	.....	.....	2	.41	.....	.....	.....	.....	21	16.94	.....	.....	.....	
Dyspepsia.....	17	20.99	.....	.....	.....	70	20.78	.....	.....	.....	.....	90	18.41	.....	.....	.....	.....	30	24.79	.....	.....	.....	
Gastritis.....	14	17.28	.....	.....	.....	50	14.84	1	.30	.....	.....	73	14.93	.....	.....	.....	.....	36	29.03	.....	.....	.....	
Other diseases of the stomach, except cancer.....	1	1.23	.....	.....	.....	1	.30	.....	.....	.....	.....	8	1.64	.....	.....	.....	.....	2	1.61	.....	.....	.....	
Diarrhea.....	31	38.27	.....	.....	.....	129	38.29	.....	.....	.....	.....	499	102.09	.....	.....	.....	.....	41	33.07	.....	.....	.....	
Chronic.....	4	4.94	.....	.....	.....	8	2.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	2.42	.....	.....	.....	

TABLE VI.—Admissions to sick report, discharges, and deaths in the Army, by arms of service, with ratios per 1,000 of mean strength, for the year 1903—Continued.

	Signal Corps.				Medical Department.				Philippine Scouts.				Others.			
	810				3,369				4,888				1,240			
	Admissions.	Dis-	Deaths.		Admissions.	Dis-	Deaths.		Admissions.	Dis-	Deaths.		Admissions.	Dis-	Deaths.	
Causes of admission to sick report.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
V. DISEASES OF THE DIGESTIVE SYSTEM—continued.																
Enteritis.....	14	17.28	22.47		39	11.58	1	0.30	17	3.48			16	12.90	3	2.42
Intestinal parasites.....	1	1.23			3	.80										
Inguinal hernia.....	4	4.94	11.23		12	3.56	1	.30	6	1.23			14	11.29	5	4.03
Other hernia.....					1	.30			1	.20			1	.81		
Intestinal obstruction.....					1	.30										
Fistula in ano.....					1	.30	1	0.30					2	1.61		
Other diseases of the intestines.....	26	32.10			58	17.22	1	.30	174	35.60			33	26.61		
Biliary calculi.....					3	.89							1	.81		
Acute hepatitis.....					3	.89			1	.20			1	.81		
Hepatic abscess.....	1	1.23			2	.59	1	.30	2	.41			3	2.42		
Jaundice, catarrhal.....	1	1.23			6	1.78			3	.61			1	.81		
Other diseases of the liver.....					4	1.19										
Diseases of the spleen.....					1	.30	1	.30								
Appendicitis and abscesses of iliac fossa.....	1	1.23			22	6.53	1	.30	2	.41			4	3.23		
Total digestive system.....	142	175.31	44.94	1	547	162.35	5	1.48	4	1.19	915	187.19	8	.61	266	214.52
VI. DISEASES OF THE GENITO-URINARY SYSTEM AND ITS ADNEXA.																
Acute nephritis.....					5	1.48			7	1.43			2	1.61		
Bright's disease.....	2	2.47			9	2.67	2	.59	1	.30			4	3.23	1	.81
Cystitis and pyelonephritis.....					3	.89	1	.30								
Other diseases of the kidneys.....					5	1.48			2	.41						
Renal calculi.....	1	1.23			8	2.37			5	.61			1	.81		
Vesical calculi.....					4	1.19							1	.81		
Other diseases of the bladder.....	1	1.23			2	.59			2	.41			4	3.23		
Stricture of the urethra.....					1	.30			3	.61			3	2.42	1	.81
Other diseases of the urethra.....					2	.59			1	.30			2	1.61		

Balanitis, nongonorrheal.....																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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TABLE VI.—Admissions to sick report, discharges, and deaths in the Army, by arms of service, with ratios per 1,000 of mean strength, for the year 1903—Continued.

Signal Corps.				Medical Department.				Philippine Scouts.				Others.					
810				3,369				4,888				1,240					
Admissions.	Dis- charges.	Deaths.	Ratio.	Admissions.	Dis- charges.	Deaths.	Ratio.	Admissions.	Dis- charges.	Deaths.	Ratio.	Admissions.	Dis- charges.	Deaths.	Ratio.		
																Number.	Ratio.
Causes of admission to sick report.																	
XIV. ILL-DEFINED DISEASES.																	
Malingering				4	1.19			2	0.41			3	2.42				
Under observation, undiagnosed, and unknown	1	1.23		4	1.19	1	0.30	10	2.05			22	17.74				
Total ill-defined diseases.	1	1.23		8	2.37	1	.30	12	2.46			25	20.16				
Total for disease.	645	796.30	67.41	911.11	2,289	679.43	98	29.09	15	4.45	6,210	1,270.45	48	9.82	88	18.00	
XIII. EXTERNAL CAUSES.																	
Suicide:																	
By poison				2	.59			4	1.19								
By firearms				8	3.70												
By cutting instruments.																	
Fractures, exclusive of gunshot	2	2.47	11.23														
Dislocations	1	1.23		11	3.27			22	4.50	1	.20	23	18.66	2	1.61	2	1.61
Sprains	6	9.88		38	11.26			64	13.09			23	18.55				
Strain, muscular.				9	2.67			18	3.68			2	1.61				
Abrasions and blisters (mechanical)	1	1.23		5	1.48			60	12.37			29	23.39				
Compression of brain								1	.20			1	.81	1	.81		
Concussion of brain																	
Concussion of spine.																	
Wounds:																	
Cutaneous	8	3.70						5	1.48			21	4.30			6	4.84
Incised.	8	3.70						19	5.64			67	13.71				
Lacerated	2	2.47						12	3.68			10	2.05			9	7.26
Punctured	1	1.23						7	2.08			13	2.66			5	4.03
Gunshot	4	4.94						4	1.19			21	4.30	4	.82	2	1.61
Other traumas.	7	8.64						49	14.54			71	14.52			34	27.42

Burns and scalds.....																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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INTERNATIONAL TABLE I.—*Movement of sick, by army corps (departments), absolute numbers.*

Departments.	Mean strength.	Admitted sick.			Sick disposed of. ^a				Total days sick. ^a
		To quarters.	To hospital.	Total admissions.	Returned to duty (recovered).	Died. ^b	Otherwise disposed of.	Total.	
Department of the East . . .	16,100	7,513	12,350	19,863	19,099	60	565	19,724	232,311
Department of the Lakes . .	2,896	946	2,253	3,199	3,050	12	129	3,191	40,137
Department of Dakota . . .	2,830	951	2,515	3,466	3,321	25	106	3,452	38,851
Department of the Missouri .	6,543	2,910	5,472	8,382	8,046	37	264	8,347	91,057
Department of Texas . . .	1,803	835	1,486	2,321	2,261	7	68	2,336	30,536
Department of the Colorado .	2,667	1,166	2,441	3,607	3,442	18	105	3,565	41,447
Department of California . .	5,885	3,639	3,028	6,667	6,986	12	255	6,203	63,527
Department of the Columbia . . .	3,129	1,079	1,925	3,004	2,841	14	138	2,993	35,790
General hospitals	411	.....	499	499	1,482	66	983	2,531	174,320
United States (continental) .	42,264	19,039	31,969	51,008	49,478	251	2,613	52,342	747,976
Philippines Division	28,818	13,415	31,352	44,767	42,932	375	955	44,262	575,160
Cuba and Porto Rico	1,561	683	1,701	2,384	2,322	3	59	2,384	29,340
Total Army	67,643	33,137	65,022	98,159	94,732	629	3,627	98,988	1,352,476

^a Includes cases remaining from last year.^b Includes suicides and accidents.INTERNATIONAL TABLE II.—*Movement of sick, by army corps (departments), proportionate numbers.*

Departments.	In 1,000 of mean strength.			In 1,000 sick disposed of. ^a			Days lost. ^a	
	Total admissions.	Admissions to hospitals.	Deaths. ^b	Returned to duty (recovered).	Died. ^b	Otherwise disposed of.	Per soldier.	Per admission.
Department of the East	1,233.73	767.08	3.73	968.32	3.04	28.64	14.43	11.78
Department of the Lakes . . .	1,104.63	777.97	4.14	955.81	3.76	40.43	13.86	12.58
Department of Dakota	1,224.74	888.69	8.83	962.05	7.24	30.71	13.73	11.25
Department of the Missouri . .	1,281.07	836.31	5.65	963.94	4.43	31.63	13.92	10.91
Department of Texas	1,287.30	824.18	3.88	967.90	3.00	29.10	16.94	13.07
Department of the Colorado . .	1,325.46	915.26	6.75	965.50	5.05	29.45	15.54	11.63
Department of California . . .	1,132.88	514.53	2.04	956.96	1.93	41.11	10.79	10.24
Department of the Columbia . .	960.05	615.21	4.47	949.21	4.68	46.11	11.44	11.96
General hospitals	411	.....	.....	585.54	26.08	388.38	.....	68.87
United States (continental) . .	1,206.89	756.41	5.94	945.28	4.80	49.92	17.70	14.29
Philippines Division	1,879.54	1,316.31	15.74	969.95	8.47	21.58	24.16	12.99
Cuba and Porto Rico	1,527.23	1,089.68	1.92	973.99	1.26	24.75	18.80	12.31
Total Army	1,451.13	961.25	9.30	957.00	6.35	36.64	19.99	13.66

^a Includes cases remaining from last year.^b Includes suicides and accidents.INTERNATIONAL TABLE III.—*Movement of sick, by arms of service.*

Arms of service.	Mean strength.	Absolute numbers.					Proportionate numbers.				
		Sick admissions.		Sick disposed of. ^a			Per 1,000 of mean strength.			Per 1,000 sick disposed of.	
		Total.	To hospital.	Total.	Fit for duty (recovered).	Deaths.	Total sick admissions.	Admissions to hospital.	Deaths.	Fit for duty (recovered).	Deaths.
Infantry	25,926	40,350	26,224	40,959	39,175	277	1,556.35	1,011.49	10.68	956.44	6.76
Cavalry	12,962	21,088	14,536	21,145	20,227	104	1,678.72	1,157.14	8.28	956.59	4.92
Coast Artillery	13,244	17,649	11,408	17,619	17,021	47	1,332.60	861.37	3.55	966.06	2.67
Field Artillery	3,531	5,261	3,364	5,285	5,076	25	1,489.94	952.70	7.08	960.45	4.79
Engineers	1,330	1,875	1,098	1,923	1,834	17	1,409.77	825.56	12.78	953.72	8.84
Ordnance	743	518	155	512	490	7	697.17	208.61	9.42	957.08	13.67
Signal Corps	810	682	553	700	650	12	841.97	682.72	14.81	925.57	17.14
Medical Department	3,369	2,474	1,974	2,562	2,345	23	734.34	585.99	6.83	915.30	8.98
Philippine Scouts	4,888	6,634	4,628	6,639	6,426	104	1,357.20	946.81	21.28	967.92	15.67
Others	1,240	1,628	1,082	1,644	1,488	13	1,312.90	872.58	10.48	905.11	7.91
Total	67,643	98,159	65,022	98,988	94,732	629	1,451.13	961.25	9.30	957.00	6.35

^a Includes cases remaining from last year.

INTERNATIONAL TABLE IV.—*Movement of sick, by months.*

Months.	Absolute numbers.						Proportionate numbers.					
	Mean strength.	Sick admissions.		Sick disposed of. ^a			Per 1,000 of mean strength.			Per 1,000 sick disposed of.		
		Total.	To hospital.	Total.	Fit for duty (recovered).	Deaths.	Total sick admissions.	Admissions to hospital.	Deaths.	Fit for duty	Deaths.	
January	69,790	9,796	6,177	9,401	9,051	70	140.36	88.51	1.00	962.77	7.45	
February	69,812	8,983	5,483	8,964	8,571	58	128.67	77.82	.83	956.16	6.47	
March	69,290	9,006	5,716	9,331	8,959	55	129.98	82.49	.79	960.14	5.89	
April	68,892	8,520	5,542	8,671	8,286	57	123.67	80.44	.83	955.60	6.57	
May	68,254	8,230	5,577	8,472	8,068	59	120.58	81.71	.86	952.31	6.96	
June	67,729	7,834	5,282	7,825	7,490	39	115.67	77.99	.58	957.19	4.98	
July	66,896	8,314	5,630	8,111	7,810	55	124.28	84.16	.82	962.89	6.78	
August	66,122	8,375	5,627	8,621	8,215	51	126.66	85.10	.77	952.91	5.92	
September	65,740	7,730	5,321	7,725	7,401	48	117.58	80.94	.73	958.06	6.21	
October	66,000	7,468	5,060	7,700	7,387	43	113.15	76.67	.65	959.35	5.58	
November	66,313	6,935	4,823	7,061	6,677	54	104.58	72.73	.81	945.62	7.65	
December	66,874	6,968	4,834	7,106	6,817	40	104.20	72.29	.60	959.33	5.63	
Total	67,643	98,159	65,022	98,988	94,732	629	1,451.13	961.25	9.30	957.00	6.35	

^aIncludes cases remaining from last year.INTERNATIONAL TABLE V.—*Movement of sick in the larger garrisons.*

Garrisons.	Mean strength.	Total admissions.		Admissions to hospital.		Deaths.	
		Absolute number.	Per 1,000 mean strength.	Absolute number.	Per 1,000 mean strength.	Absolute number.	Per 1,000 mean strength.
Presidio of San Francisco, Cal.	2,576	3,077	1,194.49	1,308	507.76	5	1.94
Fort Leavenworth, Kans.	1,760	2,351	1,335.80	1,394	792.04	11	6.25
Fort Riley, Kans.	1,252	1,966	1,570.29	1,400	1,118.22	3	2.40
Ord Barracks, Monterey, Cal.	1,008	715	709.32	332	329.38	.....	.....
Fort Monroe, Va.	963	1,547	1,623.29	828	868.84	3	3.15
Fort Sheridan, Ill.	798	771	966.16	671	840.85	4	5.01
Camp Geo. H. Thomas, Ga.	761	1,357	1,783.18	857	1,126.16	4	5.26
Vancouver Barracks, Wash.	737	789	1,070.55	480	651.29	2	2.71
Columbus Barracks, Ohio.	695	772	1,110.79	664	955.39	.....	.....
Fort Sam Houston, Tex.	664	656	987.95	564	849.40	2	3.01
Fort Snelling, Minn.	615	904	1,469.92	602	978.86	6	9.76
Jefferson Barracks, Mo.	609	875	1,436.78	654	1,073.89	8	13.14
Fort Assiniboine, Mont.	596	806	1,352.35	619	1,038.59	3	5.03
Fort Ethan Allen, Vt.	586	757	1,291.81	407	694.54	1	1.71
Fort Totten, N. Y.	581	525	903.61	402	691.91	3	5.16
Fort Myer, Va.	573	935	1,631.76	665	1,160.56	2	3.49
Fort Thomas, Ky.	558	429	768.81	237	424.70	5	8.96
Fort Hamilton, N. Y.	555	574	1,034.23	256	461.25	1	1.80
Fort Niobrara, Nebr.	534	430	805.24	397	743.45	5	9.36
West Point, N. Y.	529	391	739.13	216	408.32	2	3.78
Fort Robinson, Nebr.	521	740	1,420.35	517	992.32	2	3.84
Fort Douglas, Utah.	500	456	912.00	298	596.00	5	10.00

INTERNATIONAL TABLE VI.—*Movement of sick according to most important diseases.*

Diseases of the international neurological table.	Absolute numbers.				Proportionate numbers.								
	Remain- ing un- der treat- ment at close of year 1902.	Admitted in 1903.	Total re- maining and ad- mitted.	Disposed of in 1903.		Remain- ing un- der treat- ment at close of 1903.	Per 1,000 of mean strength.		Per 1,000 disposed of.		Average days of treat- ment.		
				Fit for duty (re- covered).	Died.		Other- wise.	Admis- sions.	Deaths.	Fit for duty (re- covered).		Died.	Other- wise.
1 Alkohollismus acutus, in- cluding delirium tremens.	18	1,597	1,615	1,588	9	27		23.61	0.13	977.55	5.61	16.83	8.73
2 Bronchitis acuta.	49	3,874	3,923	3,810	1	33		57.27	.01	991.16	.26	8.58	5.52
3 Cholera asiatica.	7	149	156	57	96	3		2.20	1.42	365.39	615.38	19.23	8.87
4 Cholera nostras.	1	47	48	48				.69		1,000.00			4.45
5 Diphtheria et croup.	1	26	27	25		2		.38		925.93		74.07	24.77
6 Dysentaria.	397	2,651	2,948	2,462	50	268		37.71	.74	885.61	17.99	96.40	44.58
7 Erysipelas.	3	48	51	44	1	2		.71	.01	936.17	21.28	42.55	17.92
8 Febris intermittens (mala- ria).	189	11,230	11,419	11,195		151		166.02		986.69		13.31	6.34
9 Febris recurrens.													
10 Gonorrhoea.	326	5,423	5,749	5,152		278		80.17		948.80		51.20	21.84
11 Hernia.	46	245	291	194		65		3.62		749.04		250.96	59.92
12 Influenza.	18	2,330	2,348	2,292		35		34.45		984.96		15.04	5.49
13 Inoculatio (Hitzschlag, coup de chaleur).													
14 Meningitis cerebro-spinalis epidemica.		198	198	188	1	6		2.93	.01	964.10	5.13	30.77	5.00
15 Morbilli.		2	2	1	1			.03	.01	500.00	500.00		61.50
16 Parotitis epidemica.	9	459	468	426		18		6.79		959.46		40.54	16.58
17 Pleuritis.	64	492	556	526		17		7.27		968.69		31.81	14.68
18 Pneumonia crouposa sive lobaris.	21	206	227	184	3	24		3.05	.04	872.04	14.22	113.74	36.15
19 Rheumatismus articulo- rum.	20	216	236	179	24	17		3.19	.35	813.64	109.09	77.27	31.89
20 Scarlatina.	35	627	662	601		26		9.27		968.53	41.47	90.91	20.12
21 Scorbutus.		11	11	10		1		.16		909.09			27.91
22 Syphilis.		2	2	2				.03		1,000.00			99.00
23 Trachoma.	149	1,565	1,734	1,281	4	258		23.43	.06	880.20	2.59	167.21	41.99
24 Tuberculosis pulmonum.	1	40	41	31		7		81.79		184.20		184.20	63.76
25 Tuberculosis ceterorum or- ganorum.	122	263	385	34	86	203		3.89	.53	124.54	131.87	743.99	160.43
26 Typhus abdominalis.	9	37	46	15	9	16		.55	.13	375.00	225.00	400.00	104.62
27 Typhus exanthematicus.	107	845	455	369	30	16		6.14	.44	899.10	72.29	38.55	72.54
28 Ulcus molle (inclusive adenitis venerea).													
29 Varicella.	184	2,159	2,343	2,073		93		31.92		967.06		42.94	24.41
30 Morbilli.	1	39	40	31	3	8		.58	.04	837.84	81.08	81.08	34.26
31 Morbilli.	41	697	641	581		72		8.83		980.60		119.40	23.71

31	Morbi cordis.....	42	322	364	190	22	123	335	29	12,281	4.76	.33	567.17	66.67	367.16	38.14
32	Morbi cutis.....	184	7,604	7,788	7,497	2	132	7,631	157	74,130	112.41	.03	982.44	.26	17.30	9.76
33	Morbimenteris.....	30	72	102	1	1	87	89	13	5,022	1.06	.01	11.24	11.24	977.52	69.76
34	Morbi oculi.....	64	1,132	1,196	1,036	.....	108	1,144	52	21,149	16.73	.....	906.59	.....	94.41	18.68
35	Morbi systemat. urin. et sexual. (exclusive venerea et syphilis).....	59	1,116	1,176	1,029	19	69	1,117	58	24,889	16.50	.28	921.22	17.01	61.77	22.30

INTERNATIONAL TABLE VII.—Most important diseases by arms of service.

Diseases of the International nosological table.	Absolute numbers—Admissions by arms of service.										Proportionate numbers—Admissions per 1,000 of mean strength.									
	Infantry.	Cavalry.	Coast Artillery.	Field Artillery.	Engineers.	Ordnance.	Signal Corps.	Medical Corps.	Philippine Scouts.	Others.	Infantry.	Cavalry.	Coast Artillery.	Field Artillery.	Engineers.	Ordnance.	Signal Corps.	Medical Corps.	Philippine Scouts.	Others.
1 Alcoholismus acutus, including delirium tremens.	672	178	564	42	27	22	22	49	2	19	25,92	14,17	42,58	11,89	30,30	29,61	27,16	14,64	0,41	15,32
2 Bronchitis acuta.	1,367	758	1,098	300	66	32	15	78	170	80	52,73	60,35	76,11	84,96	49,62	43,07	18,52	23,15	34,78	64,52
3 Cholera asiatica.	86	10	1	1	1	1	1	5	44	28	3,83	8,80	8,08	28	75	2,69	1,23	1,48	9,00	.....
4 Cholera nostras.	22	9	3	1	1	2	1	4	6	1	46	72	23	30	57	2,69	1,19	1,19	1,23	.....
5 Diphtheria et croup.	12	5	4	2	2	2	2	2	2	1	46	40	30	30	57	2,69	1,19	1,19	1,23	.....
6 Dysentery.	1,988	460	102	58	75	6	49	108	88	17	61,25	36,62	7,70	16,43	56,39	8,08	60,49	32,06	18,00	13,71
7 Erysipelas.	26	6	4	5	3	1	1	2	1	1	1,00	48	80	1,42	2,26	1,85	59	59	18,00	13,71
8 Febris intermittens (malaria).	5,478	2,155	646	216	221	21	77	187	2,156	73	211,29	171,55	48,77	61,18	166,16	28,26	96,06	55,51	441,08	58,87
9 Febris recurrens.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 Gonorrhoea.	2,340	1,426	870	294	95	5	69	111	161	52	90,26	113,52	65,69	83,26	71,43	6,73	85,18	32,95	32,94	41,98
11 Hernia.	100	38	47	11	7	3	4	13	7	15	3,86	3,03	3,55	3,12	5,26	4,04	4,94	3,86	1,43	12,10
12 Influenza.	767	279	810	138	84	39	10	103	1	99	29,58	22,21	61,16	39,08	63,16	52,49	12,35	30,57	20	79,84
13 Insolutio (Hitzschlag, coup de chaleur).	79	63	34	2	6	2	.....	3	9	.....	3,05	5,02	2,57	57	4,51	2,69	.....	89	1,84	.....
14 Meningitis cerebro-spinalis epidemica.	1	.....	1	.....	.....	.....	.....	.....	.....	.....	04	.....	08	.....	.....	.....	.....	.....	.....	.....
15 Morbilli.	130	69	118	41	9	2	2	9	3	76	5,01	5,49	8,91	11,61	6,77	2,69	2,47	2,67	61	61,29
16 Parotitis epidemica.	206	53	100	46	8	1	2	9	22	45	7,95	4,22	7,55	13,03	6,02	1,35	2,47	2,67	4,50	36,29
17 Pleuritis.	75	34	38	10	5	2	4	17	14	7	2,89	2,71	2,87	2,83	3,76	2,69	4,94	5,05	2,86	5,65
18 Pneumonia cronica sive lobaris.	73	41	28	23	9	.....	2	9	20	11	2,82	3,26	2,11	6,51	6,77	2,69	2,47	2,67	4,09	8,87
19 Rheumatismus articulo-rum.	252	129	136	36	14	4	6	19	17	14	9,72	10,27	10,27	10,20	10,53	5,88	7,41	5,64	3,48	11,29
20 Scarlatina.	3	2	3	1	.....	.....	.....	2	.....	.....	12	16	23	28	.....	.....	.....	59	.....	.....
21 Scorbutus.	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	04	.....	.....	.....	.....	.....	.....	.....	.....	.....
22 Syphilis.	684	413	276	85	29	2	11	41	17	28	26,38	32,88	20,76	24,07	21,80	2,69	13,98	12,17	3,48	22,68
23 Trachoma.	15	9	11	1	.....	.....	.....	1	3	.....	58	72	83	3,96	.....	.....	1,23	.....	.....	.....
24 Tuberculosis pulmonum.	87	37	49	14	3	4	4	20	35	10	3,36	2,95	3,70	3,96	2,26	5,88	4,94	5,94	7,16	8,06
25 Tuberculosis ceterorum organorum.	12	9	6	1	1	2	.....	2	3	1	46	72	45	28	75	2,69	.....	59	61	81
26 Typhus abdominalis.	114	109	50	23	16	2	2	19	5	8	4,40	8,68	3,78	6,51	12,03	2,69	2,47	5,64	1,02	6,45
27 Typhus exanthematicus.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28 Ulcus molle (inclusive acutis venerea).	1,023	437	841	115	41	8	20	41	39	19	39,46	41,16	25,75	32,57	30,85	4,04	24,69	12,17	7,98	15,32
29 Varicella.	18	5	1	2	1	.....	2	.....	7	3	69	40	08	57	75	.....	2,47	2,47	1,43	2,42
30 Morbi auris.	251	118	111	42	12	6	3	22	15	17	9,68	9,39	8,38	11,50	9,12	8,08	3,70	4,83	3,07	13,71

31	Morbi cordis.....	126	71	56	10	8	1	7	13	10	20	4.86	5.65	4.23	2.83	6.02	1.35	8.64	3.86	2.05	16.13
32	Morbi cutis.....	3,037	1,834	1,371	440	124	26	39	132	517	84	117.14	146.00	103.52	124.61	93.23	84.99	48.15	39.18	105.77	67.74
33	Morbi mentis.....	28	10	17	4	.....	1	.....	9	1	2	1.08	.80	1.28	1.13	.....	1.35	.....	2.67	.20	1.61
34	Morbi oculi.....	423	204	202	70	16	7	13	51	120	26	16.32	16.24	15.25	19.82	12.08	9.42	16.06	15.14	24.56	20.97
35	Morbi systemat. urin et sexual. (exclusive veneria et syphilis).....	485	173	271	38	11	4	8	53	49	24	18.71	13.77	20.46	10.76	8.27	5.38	9.88	15.78	10.02	19.35

INTERNATIONAL TABLE VIII.—*Most important diseases by month.*

Diseases of the international nosological table.	Admissions by months.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 Alkoholisumus acutus, including delirium tremens.	149	115	154	119	115	132	118	129	143	132	114	177
2 Bronchitis acuta	538	575	377	328	274	196	157	167	211	253	353	425
3 Cholera asiatica	29	1	1	25	23	18	14	8	11	9	8	2
4 Cholera nostras			6	4	3	9	9	12	4	2	1	2
5 Diptheria et croup	2	2	5		4	2	2	2	4	2	2	2
6 Dysenteria	213	221	246	249	274	229	271	226	201	162	137	92
7 Erysipelas	8	10	8	3	3	2	1	3	1	2	2	6
8 Febris intermittens (malaria)	1,263	1,031	965	1,092	1,141	1,074	1,099	1,030	965	685	507	418
9 Febris recurrens.												
10 Gonorrhoea.	486	337	357	419	435	474	496	455	528	489	460	487
11 Hernia	27	17	27	18	25	15	21	20	23	17	15	20
12 Influenza	264	753	725	191	84	16	7	29	43	61	46	111
13 Insolatio, Hitzschlag, coup de chaleur.	3	11	8	19	19	18	45	19	22	13	13	8
14 Meningitis cerebro-spinalis epidemica												
15 Morbilli	14	57	118	77	35	43	15	4	2	1	59	34
16 Parotitis epidemica	63	80	107	73	54	39	33	10	5	2	2	22
17 Pleuritis	28	16	23	17	13	16	14	14	18	12	18	13
18 Pneumonia crouposa sive lobaris.	22	24	29	17	13	16	11	11	16	20	17	13
19 Rheumatismus articulorum	77	66	60	56	58	37	43	31	49	57	50	48
20 Scarlatina	1	1	1	1	5	1	1					
21 Scorbutus												
22 Syphilis	190	145	124	133	112	107	122	112	132	132	125	161
23 Trachoma	8	2	15	1	1	3	7	4	1	1	3	4
24 Tuberculosis pulmonum	35	24	16	25	24	21	26	11	29	20	15	18
25 Tuberculosis ovarii	5	5	4	2	1	6	2	5	3	3	2	
26 Typhus abdominalis	48	23	17	19	16	26	29	58	42	36	23	11
27 Typhus exanthematicus												
28 Typhus molle (inclusive adenitis venerea)	201	161	167	181	176	144	189	170	181	198	181	210
29 Varicella	3	4	5	5	4	4	6	5	3	3	3	3
30 Morbi auris	61	57	63	40	47	42	57	51	40	47	45	47
31 Morbi cordis	37	37	27	31	20	21	20	19	28	29	23	30
32 Morbi cutis	655	533	588	588	641	730	752	734	678	624	527	634
33 Morbi mentis	9	9	7	6	5	4	4	8	6	6	6	6
34 Morbi oculi	106	83	126	105	97	110	95	88	76	86	81	77
35 Morbi systemat. urin. et sexual. (exclusive veneria et syphilis)	124	91	86	82	90	90	108	87	73	112	78	95

INTERNATIONAL TABLE IX.—Deaths by rank, by length of service, and by age.

Cause of death.		Total number of deaths (enlisted men).		Deaths by rank and length of service.				Deaths by age.					
		Absolute numbers,	Per 1,000 of mean strength.	Noncommissioned officers.	Soldiers in first year of service.	Soldiers in second year of service.	Soldiers in third year and of more service.	20 and under.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 and over.
Deaths from sickness.	Soldiers present with troops	499	7.79	96	36	134	233	31	209	136	57	33	33
	Soldiers absent from troops												
Accidental deaths	Soldiers present with troops	79	1.23	12	10	17	40	3	44	14	7	4	7
	Soldiers absent from troops												
Suicides	Soldiers present with troops	32	.50	13	1	3	15	3	10	12	5		2
	Soldiers absent from troops												
Grand total		610	9.52	121	47	154	288	37	263	162	69	37	42

INTERNATIONAL TABLE X.—Discharges from the Army for physical disability, temporary or permanent, by rank, by length of service, and by age.

Cause of discharge.	Total discharges (enlisted men).		Rank and length of service.				Age.					
	Absolute numbers.	Per 1,000 of mean strength.	Noncommissioned officers.	Soldiers in first year of service.	Soldiers in second year of service.	Soldiers in third year and of more service.	20 and under.	21 to 25.	26 to 30.	31 to 35.	36 to 40.	41 and over.
Physical disability existent prior to enlistment	334	5.22	10	219	60	45	12	218	67	29	4	4
Physical disability incident to service	877	13.69	124	97	243	413	22	430	227	107	46	45
Physical disability not incident to service	371	5.79	28	80	118	145	13	226	91	30	9	2
Grand total	1,582	24.70	162	396	421	603	47	874	385	166	59	51

REPORT OF THE PAYMASTER-GENERAL.

REPORT OF THE PAYMASTER-GENERAL.

WAR DEPARTMENT,
PAYMASTER-GENERAL'S OFFICE,
Washington, September 15, 1904.

SIR: I have the honor to submit the following report for the fiscal year ending June 30, 1904:

On July 1, 1903, officers of the Pay Department were charged with public funds aggregating.....	\$5, 320, 647. 19
During the fiscal year these officers received—	
From the United States Treasury.....	30, 678, 470. 00
From soldiers' deposits.....	1, 585, 687. 60
From army paymasters' collections.....	854, 095. 75
Total balances and receipts	38, 438, 900. 54

Accounted for as follows:

Expended on account of pay of the Army.....	31, 111, 051. 59
Expended on account of pay of the Army, war with Spain (on Treasury certificates) ^a	26, 299. 96
Expended on account of extra pay to Regular Army, war with Spain (on Treasury certificates) ^a	2, 532. 98
Expended on account of extra pay to volunteers, war with Spain (on Treasury certificates) ^a	6, 514. 63
Expended on account of mileage to officers ^b	447. 81
Expended on account of reimbursement to contract surgeons (on Treasury certificates).....	558. 06
Expended on account of Army War College.....	3, 874. 32
Expended on account of pay of Military Academy.....	403, 280. 96
Expended on account of volunteers (Treasury certificates) ^a	106, 947. 90
Total expenditures	31, 661, 508. 21
Surplus funds deposited to credit of United States Treasurer.....	2, 933, 326. 36
Army paymasters' collections deposited to credit of United States Treasurer.....	854, 095. 75
Balances charged officers June 30, 1904	2, 989, 970. 22
Total accounted for.....	38, 438, 900. 54

^a These figures represent only the actual amount paid on Treasury certificates during the fiscal year by the chief disbursing officer, Paymaster-General's Office; all certificates issued since January 1, 1904, have been paid by Treasury warrant.

^b These figures represent only payments of mileage accounts involving the fiscal years 1901 and 1902; the army appropriation acts approved June 30, 1902, and March 2, 1903, respectively, having provided that payments on account of "mileage to officers" during the fiscal years 1903 and 1904 shall be accounted for under the general head of "Pay, etc., of the Army." For statement of aggregate amount actually disbursed on account of mileage during the past fiscal year, see pages 10 and 11 of this report.

GENERAL REVIEW.

The amount of \$28,121,561.83, appropriated by the act of Congress of March 2, 1903, for payment of the Army for the fiscal year, was supplemented by the sum of \$1,500,000 in act of April 27, 1904, to provide a working balance for paymasters. The claims upon the appropriation have now been substantially liquidated and this additional \$1,500,000 will probably be returned to the Treasury.

The money accountability of the Department for the year reached the gross sum of \$79,257,204.66, of which \$5,320,647.19 was on hand June 30, 1903, and \$2,989,970.22 remained on hand June 30, 1904. Detailed statements of this accountability and of the transactions of individual disbursing officers are subjoined in tabular form.

All public funds received by the disbursing officers have been accounted for satisfactorily. Reports received indicate that the troops have been paid with promptness and regularity. Equally with the men at home stations, those serving in the Philippine Islands, China, Hawaii, Alaska, and Porto Rico have received their money without unnecessary delay after each muster. Monthly payments have been extended generally to all the troops, including those serving in the Philippines, except in the Department of Mindanao, where bi-monthly payments continue to be made for the reason that transportation facilities for the paymaster and his funds for monthly trips have not been available.

In the payment of troops, as in all other duties, paymasters have worked faithfully and energetically, and I am gratified to be able to state that not a single report or complaint has reached this office of delayed payments due to neglect on the part of paymasters.

The work of this office has been performed systematically and diligently and is kept well up to date in all respects. The permanent clerical force of the office is wholly insufficient for the work, and I shall later on submit a special report with recommendations looking to a reorganization of the force.

DETAILS FROM THE LINE.

The act of February 2, 1901, provided that all vacancies in the grade of captain in the Pay Department should be filled by detail of captains of the line.

At present there are 15 detailed officers in the Department. The system so far has given complete satisfaction, due in large measure to the excellent character and efficiency of the officers so detailed.

I am not, however, in favor of the detail system above the grade of captain, and in this connection would invite attention to my report on this subject dated April 2, 1904.

DEPOSITS.

Number and amounts of deposits received from and repaid to soldiers on discharge from July 1, 1872, to June 30, 1904.

Fiscal year ending June 30—	Deposits received.		Deposits repaid.		
	Number.	Amount.	Number.	Principal.	Interest.
1873.....		\$209,850.38			
1874.....		346,609.56			
1875.....		325,255.80			
1876.....		435,912.68			
1877.....	5,621	328,565.05	14,752	\$1,041,001.57	\$49,712.60

REPORT OF THE PAYMASTER-GENERAL.

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Number and amounts of deposits received from and repaid to soldiers on discharge from July 1, 1872, to June 30, 1904—Continued.

Fiscal year ending June 30—	Deposits received.		Deposits repaid.		
	Number.	Amount.	Number.	Principal.	Interest.
1878.....	5,524	\$346,243.94	3,182	\$145,667.91	88,420.24
1879.....	6,087	470,770.38	4,926	257,854.48	17,706.93
1880.....	8,635	477,174.44	8,084	392,568.93	30,680.97
1881.....	8,942	524,112.72	8,148	501,949.77	38,722.62
1882.....	6,890	448,561.83	7,570	428,482.44	31,658.73
1883.....	7,902	407,544.68	6,695	363,578.34	26,123.60
1884.....	7,114	389,267.55	8,184	404,291.57	31,124.93
1885.....	7,033	427,617.96	6,930	401,902.22	38,249.44
1886.....	7,261	469,031.55	7,835	490,506.79	46,583.23
1887.....	6,889	436,574.98	6,988	389,083.12	34,758.24
1888.....	7,409	386,944.10	6,346	323,952.97	29,327.01
1889.....	7,892	383,798.34	7,664	396,468.53	33,647.38
1890.....	7,634	395,128.82	7,206	411,039.74	41,596.60
1891.....	6,790	403,473.15	9,106	553,047.45	51,797.70
1892.....	5,570	334,464.70	8,019	410,873.15	38,894.26
1893.....	5,870	282,248.04	5,317	268,835.46	26,059.07
1894.....	5,914	361,830.76	5,786	290,088.98	27,014.32
1895.....	6,284	318,270.73	5,880	308,372.45	28,766.42
1896.....	8,778	420,338.87	6,486	359,200.43	38,614.66
1897.....	17,878	535,392.64	6,976	345,559.55	34,850.53
1898.....	21,856	613,513.51	17,377	561,518.64	45,815.61
1899.....	37,842	1,496,762.31	28,508	988,774.63	61,278.95
1900.....	91,461	3,215,544.66	27,571	1,028,146.34	43,234.89
1901.....	111,004	3,438,529.11	78,948	2,955,169.39	114,750.37
1902.....	80,833	2,660,250.66	129,271	3,708,820.19	190,957.77
1903.....	61,948	1,888,014.37	59,968	2,134,191.91	123,298.48
1904.....	59,970	1,585,687.60	62,198	1,838,105.64	107,032.95
Total.....		24,763,305.87		21,699,052.59	1,390,674.79
Amount remaining to credit of depositors.....		3,064,253.28			

NOTE.—Repayment of deposits to soldiers from July 1, 1872, to June 30, 1876, were not recorded by fiscal years. The repayments of 1877 include all deposits repaid prior thereto.

The above table gives a complete history of soldiers' deposits since the passage of the act authorizing them May 15, 1872. As will be seen by reference to the table, the number and amount of the deposits varied comparatively little from the beginning of the system until the fiscal year of 1897 and the breaking out of the Spanish war.

On last report the number of deposits received was short reported 6,397. This number of deposits has been added to the 1903 deposits in this report.

As will be seen by the above table, the deposits by enlisted men during the year amounted to \$1,585,687.60, making the total amount deposited since the existing law has been in force, \$24,763,305.87. All officers in immediate command of troops agree that the law is of great benefit to the Army in affording soldiers an absolutely safe means of accumulating their savings.

Legislation, however, is recommended, if practicable, to the end that a soldier's deposit book shall not be sold, pledged, assigned, or transferred, except after discharge and when accompanied by the soldier's final statements. That such pledging, etc., shall be made a military offense for which the soldier may be retained in the service for trial by court-martial, and that the possession thereof by any person as security for a loan to the soldier during the period of his service shall work a forfeiture of such deposits. Much complaint has been made by company commanders of the pernicious practice of money lenders, especially in San Francisco, who, it is believed, not only loan enlisted men money on the security of their deposit books, but lie in wait for them when discharged, and practically confiscate or extort a large percentage of what is due them from the Government. The evil is a crying one, and clearly akin to that which exists in any large seaport, where seamen are stripped of their hard earnings by boarding-house runners and touts. If the deposit book can be made utterly without value in case of such use it will be of benefit to the service as well as to the soldier.

ALLOTMENTS.

Probably no part of the business of the Pay Department requires more unceasing watchfulness and is the source of so much and such vexatious correspondence as the allotment system. Originally intended as a measure beneficial to the families of soldiers on distant service, at a time when the number of troops on such service was very large, it has, to a considerable extent, been made a subject of speculation by money lenders who waylay troops about to embark for foreign service and induce them to borrow money for present use, securing payment thereof by allotments of pay. In some cases allotment of a large proportion of the soldier's pay for several months is secured, to the detriment of the service, not only at the time but during the life of the allotment, as the soldier, having discounted his pay for months in advance, has little to receive when pay day comes around and is consequently discontented, uneasy, and likely to be easily tempted to desert.

While the revision of the regulations now in progress in some measure tends to prevent this by more stringent rules, it is recommended that the law authorizing allotments be so amended as to prohibit allotments except for the benefit of the soldiers' families and dependent relatives.

Provision for their "own benefit" is already made by the deposit system, under which they secure a greater rate of interest than is ordinarily paid by savings banks. If permitted to allot to a bank as an investment of their savings, it allows them to accumulate a fund which can be availed of at any time they wish to abandon the service; while if they deposit their savings with a paymaster the accumulation, being in the hands of the Government and forfeited by desertion, is a powerful incentive to good and faithful service.

PAY AND ALLOWANCES OF OFFICERS.

I would earnestly recommend an increase in the allowance for commutation of quarters of officers. Under existing laws the following monthly commutation allowances are now paid to officers under the grade of lieutenant-general, when entitled thereto, the rate per room being \$12:

Second lieutenant, 2 rooms.....	\$24
First lieutenant, 2 rooms	24
Captain, 3 rooms.....	36
Major, 4 rooms.....	48
Lieutenant-colonel, 4 rooms.....	48
Colonel, 5 rooms.....	60
Brigadier-general, 5 rooms.....	60
Major-general, 6 rooms.....	72

The rate per room per month could remain as at present, \$12, but the number of rooms should be increased by one successively for all of the stated grades above second lieutenant, which would give the following monthly allowances:

Second lieutenant, 2 rooms.....	\$24
First lieutenant, 3 rooms.....	36
Captain, 4 rooms.....	48
Major, 5 rooms.....	60
Lieutenant-colonel, 6 rooms.....	72
Colonel, 7 rooms.....	84
Brigadier-general, 8 rooms.....	96
Major-general, 9 rooms.....	108

I think consideration of these schedules will show that the existing allowances are inadequate and that the proposed increase is not excessive, but entirely reasonable.

I do not know when the present allowance of rooms was originally established, but I find the table in the Army Regulations of 1861, showing the number of rooms allowed to officers from major-general down to be identical with the corresponding table in the regulations of 1901. There has been no change, then, in this respect in the last forty years.

The commutation allowance of \$12 was established by the act of Congress approved June 23, 1879, which amended the act of June 18, 1878, fixing the allowance at \$10. Previous to the latter date the rate seems to have been fixed by the Secretary of War (A. R. 1080 of 1861). During or near the close of the civil war the rate was made \$18 per room, and this rate remained in force until the passage of the act of June 18, 1878.

The prevailing rates of pay for officers of the Army were fixed by the law of July 15, 1870. There has, therefore, been no increase in pay for thirty-four years, while, as shown above, the rate per room for commutation of quarters has actually been reduced one-third during that period. At the same time the cost of living, especially in the item of house rent, has very largely increased, particularly in all of the larger cities. A major-general's commutation allowance of \$72 would not pay the rent of a modern flat in any of our large cities, and a conveniently located and suitable house would be entirely out of the question. There is no possibility that an officer of any grade with a family can rent a suitable house in such places as New York, Washington, Chicago, or San Francisco for the amount of his commutation. In this connection it may be of interest to note that the regulations of 1861 recognized the fact of the varying cost of living in different parts of the country, paragraph 1081 establishing rates of \$8, \$9, \$12, and \$20 per room, depending on location.

In any readjustment in the line of this recommendation the allowance of the lieutenant-general should be increased to correspond with increase for junior officers. His present allowance of \$100 per month is not based upon a given number of rooms, but was fixed separately at the sum named in the law of June 30, 1882.

PAYMENT OF POSTS AND STATIONS.

The system of express payment for troops at home posts not in the immediate vicinity of a pay station, which was initiated in the latter part of 1895, has not been found to work advantageously, particularly for large commands, and therefore I have heretofore made recommendation for such modification of the system as will permit payment to be made by paymasters in person where the expense of their travel will not be disproportionate to the amount disbursed. With a view to the utmost economy in this direction, "trips" for paymasters have been suggested for approval and adoption. These trips contemplate that all troops within a given area shall be paid in one pay tour on each muster, and are so arranged that the distance to be traversed shall be the minimum necessary for traveling by the shortest usually traveled route between the posts and places enumerated in each trip.

For many reasons personal payment by the paymaster is the most

satisfactory to all concerned, and in my judgment that method of paying troops should be authorized and required in all cases except in instances where the expense of making payment is out of due proportion to the sum paid, or where, for other good and sufficient reasons, personal payment may be inexpedient or impracticable.

The two companies of artillery stationed at Honolulu, Hawaii, are paid by express from San Francisco. Troops in the Philippine Islands are paid chiefly by paymasters in person, a few small detachments being paid by express. Of the six posts in Alaska, forts W. H. Seward and Liscum are paid by express from Portland, Oreg., and forts Davis, Egbert, Gibbon, and St. Michael, in cash, by the respective post commanders, who have been designated by the War Department as acting paymasters with a view to making such payments. The posts thus paid can not be reached from the outside except for about three months of the year, and therefore regular periodical payment by a paymaster in person or by express is not practicable. Under the present arrangements funds for the year in coin and currency are shipped to each post commander and he makes monthly payment to the troops of his post from these funds, rendering proper accounts of his disbursements to this office at stated intervals. The commanders engaged in this disbursing duty have informed this office that the plan of payment herein outlined has worked to the entire satisfaction of the officers and men at the posts in question.

The legation guard at Pekin, China, consisting of a company of the Ninth Infantry, is paid by the commanding officer under arrangements and instructions similar to those indicated for Alaskan payments and with like satisfactory results. The Porto Rico Provisional Regiment of Infantry is paid by express from New York City.

RIFLE PRACTICE.

The appropriation bill approved March 2, 1903, provides "that expert riflemen hereafter qualifying as such shall receive one dollar per month in addition to their pay," and \$12,000 was appropriated therefor. This was a move in the right direction, for the efficiency of an army in the field depends on the ability of each individual soldier to properly handle his rifle. In times of peace every effort should be made to teach men to shoot, and every inducement possible should be offered to cause them to take more than ordinary or perfunctory interest in target practice. I believe if expert riflemen were allowed \$3 per month extra, sharpshooters \$2 per month, and marksmen \$1 per month during each year they qualified, interest in the work would be stimulated and the results would be such as to show the wisdom of this increase.

The reports for the target year ending December 31, 1903, show 61 expert riflemen, 349 sharpshooters, and 500 marksmen, and were this allowance in effect the cost to the Government would only exceed the amount appropriated above for expert riflemen alone by about \$4,500.

I respectfully suggest legislative action as above indicated.

MILITIA.

Much additional work has been entailed on this office by the payment of troops of the National Guard when participating with the Regular Army in maneuvers and camps of instruction, and the examination of the accounts of State disbursing officers covering payments

to State troops in State camps of instruction under section 14 of the act of January 21, 1903. The many questions propounded by such disbursing officers, inexperienced in the laws governing payments to the Regular Army, which must govern in all payments to State troops from United States funds, has caused a large amount of correspondence.

At the combined maneuvers at Westpoint, Ky., in September, 1903, a corps of paymasters was detailed for duty, not only to pay the State troops for the period of the maneuvers, but incidentally to instruct commanders in the proper method of preparing their pay rolls so that correct payment could be made. The same course will be pursued at the maneuvers at Manassas, Va., during the present summer, where a large number of troops will be present from seventeen States, and, it is hoped, will result in a desire on the part of the officers of such States for a more intimate knowledge of the laws and regulations governing these payments. The number of accounts received from State disbursing officers is 55, all of which have been promptly examined and errors reported.

PERSONNEL.

From July 1, 1903, to June 30, 1904, changes in Pay Department officers occurred as follows:

APPOINTMENT.

Col. Francis S. Dodge, Assistant Paymaster-General, appointed brigadier-general and Paymaster-General January 23, 1904.

PROMOTIONS.

Capt. George T. Holloway, paymaster, promoted major, paymaster, November 30, 1903.

Lieut. Col. Francis S. Dodge, Deputy Paymaster-General, promoted colonel, Assistant Paymaster-General, January 23, 1904.

Lieut. Col. Charles H. Whipple, Deputy Paymaster-General, promoted colonel, Assistant Paymaster-General, January 25, 1904.

Maj. John C. Muhlenberg, paymaster, promoted lieutenant-colonel, Deputy Paymaster-General, January 23, 1904.

Maj. George R. Smith, paymaster, promoted lieutenant-colonel, Deputy Paymaster-General, January 25, 1904.

Capt. William G. Gambrill, paymaster, promoted major, paymaster, January 23, 1904.

Capt. Timothy D. Keleher, paymaster, promoted major, paymaster, January 25, 1904.

Capt. William B. Schofield, paymaster, promoted major, paymaster, March 3, 1904.

COMMISSIONS VACATED.

By Brig. Gen. Alfred E. Bates, Paymaster-General, on appointment as major-general, United States Army, January 21, 1904.

By Col. Frank M. Coxe, Assistant Paymaster-General, on appointment as brigadier-general, United States Army, January 23, 1904.

RETIREMENTS.

Capt. Joseph S. Wilkins, paymaster, October 28, 1903.

Maj. William W. Gilbert, paymaster, March 3, 1904.

DEATHS.

Capt. William M. Graham, paymaster, November 15, 1903.

Maj. Charles E. Kilbourne, paymaster, November 30, 1903.

DETAILS FROM LINE.

Capt. William F. Creary, infantry, August 27, 1903.
 Capt. Arthur W. Chase, artillery, August 27, 1903.
 Capt. Charles W. Fenton, cavalry, September 19, 1903.
 Capt. John M. Sigworth, infantry, November 21, 1903.
 Capt. Marcellus G. Spinks, artillery, November 28, 1903.
 Capt. George W. Moses, cavalry, December 21, 1903.
 Capt. Thomas H. R. McIntyre, artillery, April 7, 1904.
 Capt. Preston Brown, infantry, April 7, 1904.
 Capt. Frederick R. Day, infantry, April 14, 1904.
 Respectfully submitted.

F. S. DODGE,
Paymaster-General, U. S. Army.

The SECRETARY OF WAR.

Mileage disbursements for the fiscal year ending June 30, 1904.

	Mileage.		Pay of the Army.	
	1901.	1902.	1903.	1904.
Inspection of the Army:				
By the General Commanding the Army, accompanied by his aids, and the generals commanding the several military departments, accompanied by officers of their staffs, as provided by paragraph 211, Army Regulations			\$191.54	\$9,057.51
By officers of the Inspector-General's Department			239.52	7,784.98
By officers of the Quartermaster-General's Department		\$44.12	562.34	10,547.78
By officers of the Commissary-General's Department				1,801.64
By officers of the Medical Department		1.68	529.69	3,804.81
By officers of the Ordnance Department			896.01	12,608.27
By officers of the Engineer Department				55.64
By officers of the Signal Corps		17.20	640.26	5,064.34
By officers of artillery (artillery inspection)				252.72
Inspection by line officers of—				
Troops			12.88	396.50
Horses			579.74	2,057.50
Engineer and other property			7.12	108.86
Artillery districts			66.32	3,228.96
Ordnance				7.84
Old ordnance				9.38
Experimental ordnance				140.63
Submarine mines			20.10	566.57
Colleges			30.52	788.84
Water supply at Fort Leavenworth, Kans.			16.78	
Lewis depression position finder				56.96
Militia			1,969.62	8,747.04
Total for inspection of the Army		63.00	5,761.94	67,071.71
General Staff			187.78	9,445.32
Change of station		101.69	7,249.42	140,498.88
General Service and Staff College at Fort Leavenworth, Kans.			166.62	14,876.37
Travel of general officers and their aids other than for inspection			7.68	717.01
Travel in Europe and other foreign countries		28.08	851.40	3,666.27
Recruiting duty			1,610.92	82,777.08
Courts-martial and courts of inquiry—to and from		45.36	3,102.92	12,885.46
Payment of troops			19.56	9,161.10
Officers of the line ordered to express offices to obtain money for payment of troops			12.48	123.64
Treasurer and professors, Military Academy (Military Academy duty)			15.12	189.00
Instructions of Secretary of War (confidential duty)			31.92	3,624.75
Target practice, inspection of target ranges and rifle teams			42.09	14,178.91
Conducting prisoners, sick and insane			40.97	2,562.73
Attending funerals of officers and other deceased officials				33.74
Line officers on business for Quartermaster's and Commissary departments		19.88	446.45	2,601.86
Retiring boards and officers retired and ordered home			326.77	11,264.63
Boards of examination to examine officers for promotion			1,714.96	9,181.39
Boards of examination of gunners			422.69	1,172.43
Boards of examination of officers at post schools				1,685.80
Boards of survey			134.70	182.79
Board on location of buildings at Point Bonita, Cal.			7.56	1.12
Board on location of buildings at Fort Levett, Me.				50.36
Board on location of buildings at Fort Sam Houston, Tex.				12.98
Board on location of buildings at Fort Terry, N. Y.				10.26
Board on location of buildings at Fort Travis, Tex.				69.16

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Mileage disbursements for the year ending June 30, 1904—Continued.

	Mileage.		Pay of the Army.	
	1901.	1902.	1903.	1904.
Board on barracks and quarters at artillery posts in harbor of Portsmouth, N. H.				\$46.34
Board on barracks and quarters at Forts Wetherill and Getty, R. I.				3.08
Board on wharf at Camp Overton, P. I.				20.96
Board on disappearing 16-inch gun carriage.				79.10
Board on signal masts at coast artillery posts.				102.34
Board on rent, Philippine Islands.			\$60.24	184.81
Board on revision drill regulations, Hospital Corps.				467.65
Board on revision drill regulations, Coast Artillery.				429.01
Board on revision drill regulations, Field Artillery.				436.68
Board on manual of tent pitching.			44.52	
Board on water supply, Fort Revere, Mass.				3.94
Board on water supply, Fort Baker, Cal.				5.06
Board on water supply, Fort Andrews, Mass.				10.62
Board on range and position finder.			9.28	53.88
Board on horizontal base lines for fire control; paragraph 9, S. O. 78.				789.62
Board of fortification, San Juan Harbor, Porto Rico.				145.25
Board on military sites, Sequoia and Yosemite parks.				149.01
Board on site for central military post, island of Oahu, and reconnaissance of the Hawaiian Archipelago.				795.64
Board on military reservation, Indianapolis, Ind.				117.82
Board on military site, Columbus Barracks, Ohio.				110.18
Board on land at Henry Barracks, P. R.				6.08
Board on purchase of land at Fort Screven, Ga.			5.04	
Board on coaling stations, Guantanamo Bay and Bahia Honda.				649.86
Board on electrical installation.				15.68
Board on submarine torpedo boat.				76.14
Board on torpedoes, Long Island Sound.				99.90
Board on damage to private property at Fort Foster, Me.				8.78
Board on department athletic competition.				61.63
Board on sanitary condition Nacimiento, Santa Margarita and James H. Henry ranches.				63.18
Board on test of bullet for pistol for military service.				450.87
Board on test of automatic machine guns.				1,494.96
Board on test of new rifle.			20.86	
Board on purchase steamer on Puget Sound.				35.76
Board to investigate maltreatment of natives at Laog, P. I.			200.32	248.07
Leases and other legal business.				871.05
Topographical work.				19.46
Exploration wild tribes, Mindanao, P. I.				89.14
Information for artillery school at Fort Monroe, Va.				147.62
Consultation with department commander.			1.12	234.96
Duty as engineer of department.			43.82	683.08
Special investigations.			7.32	139.32
Artillery instruction at Indian Head and navy-yard gun factory.		\$28.56	142.24	1,170.96
Fire control and installation.			13.73	318.84
Verifying funds sent to Alaska.				1.12
Verifying Philippine currency.				35.70
Military surveys.			31.64	99.86
Selecting camp ground, Society Army Santiago de Cuba.				41.72
Marking lines, Gettysburg battlefield.				26.53
Marking lines, Antietam battlefield.				9.66
Army and Navy maneuvers.			398.73	6,192.87
Army maneuvers at Fort Riley, Kans.				7,647.69
Army maneuvers at West Point, Ky.				5,159.62
Army maneuvers at Manassas, Va.				408.73
Army maneuvers at American Lake, Wash.				130.86
Pursuit of deserters and escaped prisoners.				115.13
Retired officers on duty with militia.				700.50
War College.				352.43
Naval War College.				25.20
Athletic instruction.				56.56
Attending Interstate National Guard Association.				451.22
Attending American Veterinary Medical Association.				304.14
Attending Association of Electrical Engineers.			62.30	
Attending dedication statue to Maj. Gen. W. F. Bartlett.				64.12
Baltimore fire.				121.60
Duty at the Louisiana Purchase Exposition.				3,800.84
Accompanying governor of Porto Rico.				45.08
Accompanying the Filipino commissioners.				252.98
Searchlights.				31.92
Panama Canal.				351.26
Witnessing movements Japanese-Russian armies.				2,445.88
Witnessing test of shrapnel for the 3-inch field gun.				117.64
Relief South Carolina and Kansas flood sufferers.			12.81	
Friar settlement.			770.84	
Treasury certificates (duty not shown) ^a .	\$3.00	158.24	651.68	
Orders fall to state specific duty enjoined.				100.30
Total.	8.00	444.81	24,125.44	427,734.64

^a Treasury certificates have not been paid by army paymasters since January 1, 1904.

REPORT OF THE PAYMASTER-GENERAL.

Statement showing the number of pay trips made, number of days consumed in travel, posts paid, and amount of field and office disbursements made by each disbursing officer of the Pay Department, United States Army, during the fiscal year ending June 30, 1904.

Rank and name.	Num-ber of pay trips.	Days con-sumed.	Num-ber of posts paid.	Miles traveled.				Payments.				
				Ambu-lance.	Stage.	Railroad.	Steamer.	Other convey-ance.	Total.	In field.	In office.	Total.
Brigadier-general and Paymaster-General:												
Dodge, F. S.			27								\$812,381.03	\$812,381.03
Colonels and assistant paymasters-general:												
Coxe, F. M.			4								445,666.91	445,666.91
Towar, A. S.			20								327,071.00	327,071.00
Sniffen, C. C.											562,422.28	562,422.28
Whipple, C. H.											2,397,884.09	2,397,884.09
Lieutenant-colonels and deputy paymasters-general:												
Comegys, W. H.	5	28	15	462	90	4,016			4,568	\$88,778.91	982,906.67	971,686.58
Tucker, W. F.	12	14	65			2,640	96	304	3,040	60,674.40	538,306.04	538,306.04
Muhlenberg, J. C.	6	27	13	40		4,204			4,244	105,016.55	282,468.78	387,486.88
Smith, G. R.											1,346.84	1,346.84
Majors and paymasters:												
Kilbourne, C. E.			2								13,396.53	13,396.53
Halford, E. W.	8	19	32	33		2,226	878	77	3,214	131,082.00	209,900.74	340,982.74
Bulls, J. L.	8	117	50	190			6,129		6,319	362,316.38	107,247.48	469,563.86
Rogers, H. L.	9	33	38	57	4	4,248		91	4,400	148,922.60	624,578.14	768,500.74
Watrous, J. A.	14	62	24	52		7,844			7,896	94,798.83	443,718.45	728,458.28
Gilbert, W. W.	8	22	51	22		3,608			3,742	94,259.00	535,951.17	630,190.17
Rees, H. L.	24	63	106	120		4,524	1,476	252	6,372	297,120.78	692,279.12	
Vinson, W.	9	69	61	306		1,569	2,978	12	4,865	301,281.25	385,576.60	436,857.85
Wallace, H. S.	12	40	67	94		4,272	238	131	4,735	276,396.73	620,131.17	896,526.90
Payson, F. L.	16	50	46	144		780	44		968	191,384.51	456,680.53	647,216.04
Downey, G. F.	5	37	50		310	6,481			6,791	77,702.02	402,863.23	490,565.25
Goodman, T. C.	22	29	167			2,800			2,800	404,009.93	279,914.62	683,924.55
Houston, J. B.	6	19	11	19		184	376	35	614	70,442.80	256,700.12	326,143.42
Loy, B. B.	15	47	52	12		4,799	207		5,018	369,057.91	841,012.70	710,070.61
Lord, H. M.	16	14	44	33			3,622		3,740	387,252.21	283,834.95	650,587.16
Rochester, W. B., Jr.	38	35	46	315		698	14		1,027	379,968.16	296,759.94	676,728.10
Smith, R. S.	23	46	63	252		8,844			9,096	214,048.57	269,296.62	488,846.19
Howell, S.	9	13	44	24		220	942	44	1,230	117,178.31	236,806.10	368,986.41
Holloway, G. T.	14	41	70	24		5,063			5,375	254,150.94	680,584.96	934,706.89
Gambrell, W. G.	17	165	68				10,576	460	11,093	687,766.82	106,684.69	846,401.51
Kiebler, T. D.	31	102	141	467		292	6,097		6,776	398,930.90	65,080.59	468,961.49
Schofield, W. B.	17	66	86	159		70	4,511		4,770	313,526.31	167,866.71	480,894.02

Captains and paymasters:									
Pickett, G. E.	24	54	52	70	1,390	3,364	90	4,914	332,704.01
Becker, O.	16	81	34	.....	2,366	116	.....	2,482	117,313.24
Curry, M. B.	13	19	84	.....	2,366	2,633	6	2,482	872
Dawes, J. W.	18	38	32	68	.....	2,633	.....	2,482	114,141.78
Canby, Jas.	20	38	56	.....	1,597	158	12	1,767	219,238.46
Coffin, E.	53	115	189	100	5,266	874	.....	6,240	496,173.00
Lynch, J. R.	13	22	32	44	5,128	.....	16	5,188	446,449.22
Graham, W. R.	6	9	6	.....	984	.....	.....	6,984	380,422.91
Stanton, C. E. a	.....	.....	.....	.....	.....	.....	.....	377,852.81	87,920.31
Stevens, P. C.	8	66	88	362	214	3,930	.....	4,506	188,926.40
Slaughter, B. D.	14	48	50	101	1,558	1,213	.....	2,872	50,324.86
Bianvelt, W. F.	28	47	72	.....	5,304	281	.....	5,585	312,233.47
Carleton, Guy	15	49	56	92	1,458	1,487	106	3,143	200,862.66
Day, F. R.	1	1	1	.....	16	.....	.....	16	11,314.07
Irwin, F. G.	2	9	7	14	366	.....	.....	380	30,414.18
Wittenmyer, E.	12	35	38	.....	3,057	.....	18	3,075	806,954.28
McAndrew, J. W.	28	52	55	89	1,042	620	85	1,766	419,243.69
Sigworth, J. M.	3	3	19	.....	1,156	.....	.....	1,766	891,512.91
Whipple, H. S.	10	105	96	372	428	4,988	.....	5,738	202,106.42
Fenton, C. W.	3	3	33	170	252	1,747	.....	2,169	199,203.21
Creury, W. F.	42	48	49	110	3,979	236	66	4,391	67,363.36
Chase, A. W.	20	25	43	73	2,564	417	.....	4,391	133,163.13
Chase, A. W.	5	27	35	86	2,564	1,412	.....	4,391	133,163.13
McIntyre, T. H. R.	7	13	33	114	292	1,148	.....	2,446	54,138.87
Spinks, M. G.	10	10	10	.....	1,640	.....	.....	1,640	59,330.06
Roses, G. W.	.....	.....	.....	.....	.....	.....	.....	.....	118,356.09
Brown, F.	.....	.....	.....	.....	.....	.....	.....	.....	11,760.43
Acting paymasters:									
Stuyvesant, W. S.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilson, R. H.	11	.....	.....	.....	.....	.....	.....	.....	35,645.37
Kuhn, J. E.	.....	.....	.....	.....	.....	.....	.....	.....	35,429.68
Mason, J. F.	.....	.....	.....	.....	.....	.....	.....	.....	1,286.99
Judson, W. V.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Perkins, F.	11	.....	.....	.....	.....	.....	.....	.....	.....
Reichman, C.	.....	.....	.....	.....	.....	.....	.....	.....	29,990.90
Brewster, A. W.	12	.....	.....	.....	.....	.....	.....	.....	1,099.08
Girhardt, C.	.....	.....	.....	.....	.....	.....	.....	.....	55,475.84
Reeve, H. M.	11	.....	.....	.....	.....	.....	.....	.....	26,112.11
Wilson, J. B.	.....	.....	.....	.....	.....	.....	.....	.....	2,751.22
Cloman, S. A.	5	6	16	.....	.....	.....	160	.....	2,751.22
Total	715	2,071	2,732	4,839	109,459	62,266	2,027	178,995	11,674,626.31
Total	.....	.....	.....	.....	.....	.....	.....	.....	19,986,881.90
Total	.....	.....	.....	.....	.....	.....	.....	.....	31,661,508.21

a Miles traveled not stated, no report having been received from paymaster.

Statement of the account of the Pay Department, United States Army, with the

Appropriations.	In account with the Treasury.					Total.
	Balance in the Treasury July 1, 1903.	Amount of appropriations and transfer warrants.	Unexpended balances deposited.	Paymasters' collections deposited.	Repayments in settlement of accounts.	
Pay, etc., of the Army, 1904		\$29,630,169.02	\$110,376.67	\$389,693.60	\$575.53	\$30,130,814.82
Pay of Military Academy, 1904		435,062.56		252.60		435,315.22
Army War College, 1904		15,000.00				15,000.00
Pay, etc., of the Army, 1903	\$874,289.43	1,259.49	2,456,967.20	119,903.87	163.65	3,452,583.64
Pay of Military Academy, 1903	17,954.75		5,083.21	179.00		23,216.96
Pay, etc., of the Army, 1902	5,727,032.01	270.68	173,173.60	7,069.36	202.35	5,907,748.00
Pay of Military Academy, 1902	12,061.83	146.87				12,208.70
Mileage to officers traveling without troops, 1902	135,767.83		24,677.83	284.70	20.00	160,750.36
Pay, etc., of the Army, 1901 and prior years			14,845.77	4,096.46	704.54	19,646.77
Mileage to officers traveling without troops, 1901 and prior years			3,890.83	132.46	2.85	4,026.14
Pay of Military Academy, 1901	13.00					13.00
Reimbursement to contract surgeons	1,040.38		1,129.71			2,170.09
Pay of two and three year volunteers, 1871 and prior years					707.54	707.54
Extra pay to volunteers, war with Spain		228,435.41	14,756.78	650.00	26.00	243,868.19
Extra pay to Regular Army, war with Spain			22,288.22			22,288.22
Extra pay to officers and men who served in Mexican war			831.00			831.00
Three months' pay proper			328.78			328.78
Bounty to Fifteenth and Sixteenth Missouri Cavalry Volunteers			391.66			391.66
Bounty under act of July 28, 1866					100.00	100.00
CERTIFIED CLAIMS.						
Pay, etc., of the Army	1,670.85	11,189.30	1,634.53			14,494.68
Pay of Military Academy		750.00				750.00
Pay, etc., of the Army, war with Spain, 1904		200,000.00	20,909.12		68.22	220,977.34
Pay, etc., of the Army, war with Spain, 1903	78,718.79		19,034.92			97,753.71
Pay, etc., of the Army, war with Spain, 1902	145,154.80		1,095.01			146,249.81
Arrears of pay, bounty, etc., 1904		800,000.00	48,949.46			348,949.46
Arrears of pay, bounty, etc., 1903	35,779.48		17,719.91		29.92	53,529.31
Arrears of pay, bounty, etc., 1902	19,372.75		2,193.55			21,566.30
Arrears of pay, bounty, etc., 1901 and prior years			542.98			542.98
Pay of two and three year volunteers		28.58				28.58
Pay of volunteers	47.60					47.60
Pay, transportation, services, and supplies of Oregon and Washington volunteers in 1855 and 1856		4,097.63				4,097.63
Traveling expenses of California and Nevada volunteers	256.51					256.51
Bounty under act of July 11, 1862	25.00					25.00
Bounty to volunteers, their widows and legal heirs		188.50				188.50
Judgments, Court of Claims (war)		19,731.41				19,731.41
SPECIAL ACCOUNT.						
National defense (war)					78.89	78.89
Total	7,049,185.01	30,846,329.45	2,940,820.74	622,262.11	2,679.49	41,361,276.80

REPORT OF THE PAYMASTER-GENERAL.

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appropriations subject to its control during the fiscal year ending June 30, 1904.

In account with the Treasury.					Balance in the hands of paymasters June 30, 1904.	Total balances June 30, 1904.
Amount drawn by requisition—		Amount covered into surplus fund.	Total.	Balance in the Treasury June 30, 1904.		
On Pay Department request.	On Treasury settlements.					
\$30,059,000.00	\$33,012.41		\$30,092,012.41	\$38,802.41	\$2,812,552.18	\$2,851,354.59
423,000.00	6,158.66		429,158.66	6,156.56	44,844.38	51,000.94
5,000.00	2,609.85		7,609.85	7,390.15	1,125.68	8,515.83
	22,929.58		22,929.58	3,429,654.06	131,441.13	3,561,095.19
95.00	148.39		243.39	22,973.57		22,973.67
	1,510,082.01	\$4,397,665.99	5,907,748.00		6.85	6.85
375.00	325.00	11,508.70	12,208.70			
	456.11	160,294.25	160,750.36			
		19,646.77	19,646.77			
		4,026.14	4,026.14			
		13.00	13.00			
	648.51		648.51	1,521.58		1,521.58
		707.54	707.54			
	243,868.19		243,868.19			
	2,549.90		2,549.90	19,738.32		19,738.32
	102.00		102.00	729.00		729.00
		328.78	328.78			
		391.66	391.66			
				100.00		100.00
	11,189.30		11,189.30	3,305.38		3,305.38
	750.00		750.00			
46,000.00	42,014.69		88,014.69	132,962.65		132,962.65
	763.02		763.02	96,990.69		96,990.69
		146,249.81	146,249.81			
145,000.00	120,108.14		265,108.14	83,841.32		83,841.32
	279.14		279.14	52,250.17		53,250.17
	72.01	21,494.29	21,566.30			
				542.98		542.98
	28.58		28.58	47.60		47.60
	4,097.63		4,097.63			
				256.51		256.51
				25.00		25.00
	188.50		188.50			
	5,068.45		5,068.45	14,662.96		14,662.96
		78.89	78.89			
30,678,470.00	2,007,450.07	4,762,405.82	37,448,325.89	3,912,960.91	2,989,970.22	6,902,921.13

^a This amount, collected during the fiscal year on account of mileage overpaid officers, and being no longer subject to control of the Pay Department, was carried, on June 30, 1904, to credit of the general account with "National defense (war)"^b and dropped from the Pay Department appropriation ledger.

Statement showing the balance in the hands of each disbursing officer of the Pay Department, United States Army, on the 1st of July, 1903, etc.—Cont'd.

Rank and name.	Balance in hands of each paymaster on June 30, 1903.	Remitted from the Treasury in the year ending June 30, 1904.	Received from other paymasters.	Received from soldiers' deposits.	Received from paymaster's collections.	Total received and to be accounted for.	Surplus funds deposited in the Treasury.	Paymaster's collections deposited in the Treasury.	Expenditures.	Transferred to other paymasters.	Balance in hands of each paymaster on June 30, 1904.	Total accounted for.
<i>Acting paymasters.</i>												
Reichmann, Carl.			\$1,444.00	\$10,935.76	\$1,085.11	\$1,444.00		\$1,085.11	\$1,099.08		\$344.92	\$1,444.00
Wilson, R. H.			32,456.39	4,061.70	721.48	44,477.26		721.48	35,645.37		7,746.78	44,477.26
Wilson, J. B.			24,221.48	5,444.62	585.35	29,024.66		585.35	26,883.12		1,420.06	29,024.66
Perkins, Fredk.			28,512.42	11,066.66	1,793.54	34,972.39		1,793.54	29,990.99		3,966.06	34,972.39
Gerhardt, Chas.			29,916.20	5,899.50	5,442.99	42,856.40		5,442.99	26,112.11		14,879.75	42,856.40
Brewster, A. W.	\$13,598.66		66,031.20		1.76	89,832.39	\$10,109.80		56,416.84		18,953.72	89,832.39
Reeve, H. M.			3,332.02			3,332.78			2,731.22	\$340.80		3,332.78
Cloman, S.			3,432.04			3,432.04	132.32		3,299.72			3,432.04
Hudson, W. A.			850.00			850.00					850.00	850.00
Schuyler, W. S.			1,733.32			1,733.32					1,733.32	1,733.32
Morrison, J. F.			1,444.00			1,444.00			1,286.98	10.89	146.12	1,444.00
Kuhn, J. E.			1,454.89			1,454.89			1,429.68		1,025.21	1,454.89
Total	5,320,647.19	\$30,678,470.00	40,818,304.12	1,585,687.60	854,095.75	79,257,204.66	2,933,326.36	854,095.75	31,661,508.21	40,818,304.12	2,989,970.22	79,257,204.66

**REPORT OF THE CHIEF OF ENGINEERS,
MILITARY AFFAIRS.**

REPORT OF THE CHIEF OF ENGINEERS, MILITARY AFFAIRS.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, September 28, 1904.

SIR: I have the honor to present for your information the following report upon the duties and operations of the Engineer Department pertaining to military affairs for the fiscal year ending June 30, 1904:

OFFICERS OF THE CORPS OF ENGINEERS.

The number of officers holding commissions in the Corps of Engineers, United States Army, at the end of the fiscal year, including 10 who graduated from the Military Academy on June 15, 1904, but were not officially assigned to the Corps of Engineers until July 11, 1904, was 159.

Since the last annual report the Corps of Engineers has lost 4 of its officers—Brig. Gen. George L. Gillespie, who was commissioned a major-general, United States Army, January 23, 1904; Lieut. Col. Charles J. Allen, who was commissioned a brigadier-general, United States Army, January 22, 1904; Col. Charles W. Raymond, who was retired from active service June 11, 1904, at his own request, under the provisions of the act of Congress approved June 30, 1882, he having served more than forty years, and First Lieut. Nathaniel E. Bower, who was instantly killed by lightning on the target range at Fort Leavenworth, Kans., June 13, 1904.

There were added to the Corps of Engineers, by promotion of graduates of the Military Academy, 10 second lieutenants on July 11, 1904, to rank from June 15, 1904.

On the 30th of June, 1904, the officers were distributed as follows:

Commanding the Corps of Engineers and Engineer Department, and Board of Ordnance and Fortification	1
Office of the Chief of Engineers	2
Office of the Chief of Engineers and Light-House Board	1
Division engineer and The Board of Engineers	1
Division engineer, river and harbor works, and light-house district	1
Division engineer, The Board of Engineers, engineer officer, Atlantic Division, and Light-House Board	1
Division engineer, Mississippi River Commission, and river and harbor works ..	1
Division engineer	1
Division engineer and light-house district	1
Washington Aqueduct, fortifications, and river and harbor works	2
River and harbor works	17

The Board of Engineers and river and harbor works.....	1
Division engineer, fortifications, river and harbor works, and California Débris Commission.....	1
Fortifications, river and harbor works, and light-house districts.....	6
Fortifications, California Débris Commission, and light-house district.....	1
Division engineer, Mississippi River Commission, fortifications, and river and harbor works.....	1
Division engineer, fortifications, and river and harbor works.....	1
Light-House Establishment.....	3
Fortifications and river and harbor works.....	19
General Staff and Military Divisions.....	2
Leave of absence.....	2
Post of Fort Leavenworth, Kans., and First Battalion of Engineers.....	13
With Isthmian Canal Commission.....	2
Survey of Northern and Northwestern lakes.....	1
River and harbor works and light-house districts.....	3
Philippines Division.....	26
General Staff.....	1
Engineer Commissioner, District of Columbia.....	1
Post of Washington Barracks, D. C., Engineer School of Application, and Second Battalion of Engineers.....	13
River and harbor works and Yellowstone National Park.....	1
Military divisions.....	3
Military attachés with Russian and Japanese armies.....	2
United States Military Academy.....	9
Mississippi River Commission and light-house district.....	1
Assistants to Engineer Commissioner, District of Columbia.....	2
California Débris Commission.....	1
Public buildings and grounds, District of Columbia.....	1
Buildings for War College, Washington Barracks, and Government Printing Office.....	2
Mississippi River Commission.....	1
Graduating leave of absence.....	10
Total.....	159

The duties devolving upon the Corps of Engineers have been increasing year by year; they now include the command of three battalions of troops; the construction of fortifications; superintending works of river and harbor improvements; the construction and repair of light-houses; the construction of public buildings; the water supply, the municipal engineering, care of public buildings and grounds, and a share in the city government of the capital of the United States; the improvement of the Yellowstone National Park; the survey of the Northern and Northwestern lakes; the mining and debris commission in the State of California, all of which involve the expenditure of many millions annually, and, in addition to various other duties, supervision of military engineering and reconnaissance work in the several military divisions and instruction at the Military Academy and schools of application.

THE BOARD OF ENGINEERS.

The regulations for the government of the Corps of Engineers provide for a Board of Engineers, consisting of not less than three officers, designated by the Chief of Engineers with the sanction of the Secretary of War. This Board acts in an advisory capacity to the Chief of Engineers upon important questions of engineering. One of its principal duties is to plan or revise the projects for permanent fortifications of the United States.

During the fiscal year the Board has reported upon numerous subjects connected with fortification work, and various tests have been witnessed and inspections made by its members.

A statement of the composition of this Board during the past fiscal year will be found in its report.

FORTIFICATIONS.

The scheme of national defense upon which work has now been in progress since 1888 is primarily based upon a report dated January 16, 1886, submitted by the Board on Fortifications or other Defenses, popularly known as the Endicott Board. This Board indicated the localities where defenses were most urgently needed, determined the character and general extent of the defenses, with their estimated cost, and recommended for first consideration the names of 27 principal ports, arranged in the order of their importance.

The first act of Congress designed to carry out the recommendation of the Endicott Board was approved September 22, 1888. It created the Board of Ordnance and Fortification and made appropriations for beginning the manufacture of modern seacoast ordnance, but made no provision for the construction of batteries. The first appropriation for the construction of gun and mortar batteries was contained in the act of August 18, 1890, since which time appropriations of varying amounts have been made regularly each year for carrying forward the adopted scheme of coast defense, for the manufacture of ordnance, for the construction of batteries, and for torpedo defenses.

From time to time the defensive details for each locality have been carefully elaborated in projects prepared by The Board of Engineers, and in each case these projects have received the formal approval of the Secretary of War prior to the beginning of actual work. Up to the present time projects for permanent seacoast defenses have been adopted for 31 localities in the United States as follows:

- | | |
|---|--|
| 1. Frenchman Bay, Maine. | 16. Cape Fear River, North Carolina. |
| 2. Penobscot River, Maine. | 17. Charleston, S. C. |
| 3. Kennebec River, Maine. | 18. Port Royal, S. C. |
| 4. Portland, Me. | 19. Savannah, Ga. |
| 5. Portsmouth, N. H. | 20. St. Johns River, Florida. |
| 6. Boston, Mass. | 21. Key West, Fla. |
| 7. New Bedford, Mass. | 22. Tampa Bay, Florida. |
| 8. Narragansett Bay, Rhode Island. | 23. Pensacola, Fla. |
| 9. Eastern entrance to Long Island Sound. | 24. Mobile, Ala. |
| 10. New York, N. Y. | 25. New Orleans, La. |
| 11. Delaware River. | 26. Galveston, Tex. |
| 12. Baltimore, Md. | 27. San Diego, Cal. |
| 13. Washington, D. C. | 28. San Francisco, Cal. |
| 14. Hampton Roads, Virginia. | 29. Columbia River, Oregon and Washington. |
| 15. Entrance to Chesapeake Bay at Cape Henry. | 30. Puget Sound, Washington. |
| | 31. Lake Champlain. |

In addition to the above localities, the defense of the Great Lakes and the St. Lawrence River is under consideration.

The seacoast defenses of the United States are now somewhat more than 50 per cent completed. Twenty-five of the principal harbors of the United States have a sufficient number of heavy guns and mortars mounted to permit an effective defense against naval attack, and during the past four years considerable progress has been made in the installation of an adequate rapid-fire armament, now the matter of first importance.

Gun and mortar batteries.—The existing projects for seacoast defenses comprise 364 heavy guns of 8-inch, 10-inch, and 12-inch calibers, 1,296

rapid-fire guns from 2.24-inch to 6-inch caliber, and 524 mortars. The total cost for the engineering work is estimated at \$50,000,000, including what has been completed as well as what remains to be done.

Since the inauguration of the present system of coast defense the several appropriations made by Congress for the construction of gun and mortar batteries have been as follows:

Act of—	Act of—
August 18, 1890..... \$1,221,000.00	May 7, 1898..... \$3,000,000.00
February 24, 1891..... 750,000.00	July 7, 1898..... 2,562,000.00
July 23, 1892..... 500,000.00	March 3, 1899..... 1,000,000.00
February 18, 1893..... 50,000.00	May 25, 1900..... 2,000,000.00
August 1, 1894..... 500,000.00	March 1, 1901..... 1,615,000.00
March 2, 1895..... 500,000.00	June 6, 1902..... 2,000,000.00
June 6, 1896..... 2,400,000.00	March 3, 1903..... 2,236,425.00
March 3, 1897..... 3,841,333.00	April 21, 1904..... 700,000.00
Allotments from the appropriation for "National Defense," act of March 9, 1898..... 3,817,676.02	Total..... 28,693,434.02

The total number of seacoast guns and carriages for which the Chief of Ordnance reports his department has made provision, and the corresponding permanent emplacements for which the Engineer Department has made provision with the funds appropriated for construction of gun and mortar batteries, including allotments from the appropriations for "National Defense," are shown in the following table:

Type of gun or carriage.	Total carriages provided.	Total emplacements provided.
12-inch mortar carriages, model 1896.....	a 306	296
12-inch mortar carriages, model 1891.....	b 85	80
12-inch disappearing carriages, L. F., model 1901.....	11	11
12-inch disappearing carriages, L. F., model 1897.....	35	35
12-inch disappearing carriages, L. F., model 1896.....	27	27
12-inch gun-lift carriages, altered to nondisappearing.....	3	3
12-inch gun-lift carriages, model 1891.....	2	2
12-inch nondisappearing carriages, model 1892.....	c 28	27
10-inch disappearing carriages, A. R. F., model 1896.....	3	3
10-inch disappearing carriages, L. F., model 1901.....	12	12
10-inch disappearing carriages, L. F., model 1896.....	74	74
10-inch disappearing carriages, L. F., model 1894.....	d 35	35
10-inch nondisappearing carriages, model 1893.....	e 11	9
8-inch disappearing carriages, L. F., model 1896.....	38	40
8-inch disappearing carriages, L. F., model 1894.....	26	26
8-inch nondisappearing carriages, model 1892.....	f 9	9
15-inch smoothbore carriages altered for 8-inch rifles.....	21	h 21
6-inch disappearing carriages, model 1898.....	29	29
6-inch rapid-fire (Vickers-Son & Maxim) pedestal mounts.....	8	8
6-inch disappearing carriages, model 1903.....	90	90
6-inch rapid-fire, pedestal mounts, model 1900.....	44	44
5-inch balanced-pillar mounts, model 1896.....	32	32
5-inch pedestal mounts, model 1903.....	21	21
4.7-inch rapid-fire (Armstrong pattern), pedestal mounts.....	34	34
4.7-inch rapid-fire (Schneider pattern), pedestal mounts.....	1	i 1
4-inch rapid-fire (Driggs-Schroeder), pedestal mounts.....	4	4
8-inch balanced-pillar mounts.....	118	118
8-inch casemate mounts.....	2	2
8-inch pedestal mounts.....	134	134
2.24-inch rapid-fire field carriages and rampart mounts.....	70	(j)

a The number of carriages of this type provided for exceeds by 10 the number which the Chief of Engineers has notified the Chief of Ordnance are required for the emplacements he has provided.

b One in use at West Point; 4 in storage.

c One in use at Sandy Hook Proving Ground.

d One carriage is the original experimental one for this caliber of gun, and has been put out of service at the instance of the Artillery Corps.

e One at Sandy Hook Proving Ground. The number of carriages of this type provided for exceeds by 2 the number which the Chief of Engineers has notified the Chief of Ordnance are required for the emplacements he has provided.

f One at West Point and one at Sandy Hook Proving Ground.

g Five temporary; armament removed from 3.

h Temporary; armament removed from 20.

i Temporary.

j Movable mounts.

The foregoing table shows that up to the present time provision has been made for emplacing 334 heavy guns (including 26 temporary emplacements), 587 rapid-fire guns (including 1 temporary emplacement), and 376 12-inch mortars.

During the fiscal year just closed operations were carried on with unexpended balances of the appropriations carried by the regular fortification appropriation acts approved June 6, 1902, and March 3, 1903. The number of emplacements provided for under each of the foregoing acts is exhibited in previous annual reports. Under the fortification act of April 21, 1904, it is proposed to provide emplacements for 22 6-inch and 1 5-inch guns.

The total number of emplacements of every kind provided for to date by all appropriations is as follows:

12-inch.	10-inch.	8-inch.	Rapid-fire.	12-inch mortars.
105	133	96	587	376

In this total are included seventy 2.24-inch rapid-fire guns on movable mounts not requiring permanent emplacements, temporary emplacements for twenty-one 8-inch B. L. rifles on modified 15-inch carriages, one temporary emplacement for 4.7-inch rapid-fire gun, five temporary emplacements for 8-inch guns on nondisappearing carriages, and the emplacement for the original experimental 10-inch disappearing carriage. The foregoing temporary emplacements were built during the war with Spain from the "National Defense" funds. The 8-inch guns will be transferred from time to time to permanent emplacements as these are completed, and a number of them have already been so transferred. While it is proposed eventually to disarm these temporary emplacements, they can again be used in case of emergency, and have for this reason been included in the foregoing enumerations.

The status of emplacements for which funds have been provided by Congress is as follows at the close of the fiscal year:

	12-inch.	10-inch.	8-inch.	Rapid-fire.	12-inch mortars.
Guns mounted.....	93	^a 119	^b 93	^c 185	350
Ready for armament.....	8	8	3	^d 250	14
Under construction.....	4	6		152	12
Total.....	105	133	96	587	376

^a Including original experimental 10-inch carriage.

^b Twenty-three of these which have been mounted temporarily have since been dismantled.

^c One temporarily.

^d Including seventy 6-pounders not requiring permanent emplacements.

At the close of the previous fiscal year there were reported mounted:

12-inch.	10-inch.	8-inch.	Rapid-fire.	12-inch mortars.
92	115	93	178	328

A comparison of the last two tables shows an addition during the year to the completed seacoast armament of one 12-inch gun, four 10-inch guns, seven rapid-fire guns, and twenty-two mortars.

For continuing the work of construction of gun and mortar batteries in accordance with approved projects, an estimate of \$4,000,000 is submitted.

Modernizing the older emplacements.—At the present time emplacements have been provided at most of our harbors for enough high-power armament of 8-inch, 10-inch, and 12-inch caliber to afford an effective defense, and it is not contemplated to construct many more of these emplacements until an adequate rapid-fire armament to supplement the heavier guns has been installed. The construction of high-power batteries was commenced in 1890, and has been in progress ever since. All of these emplacements permit reasonably effective service of their guns, but when the earlier batteries were built there was very little known as to the speed at which modern high-power guns could be safely fired, and less as to the actual artillery methods of handling them. With experience improved methods of construction were developed, and target practice with smokeless powder, invented after many of the batteries were completed, has shown the desirability of certain additions and modifications. As rapidly as the needs were recognized they were met by changes which were incorporated in the plans for all subsequent emplacements. The latest batteries leave little to be desired; the bulk of the emplacements require only moderate additions to bring them up to full efficiency; a few of the very earliest require extensive changes and additions. The principal improvements proposed consist in widening the loading platforms to avoid accidents to the gunners and confusion in ammunition service, as well as to furnish additional storage rooms for projectiles where they are less exposed to condensation and dampness; in providing latrines in the vicinity of the emplacements; in providing adequate water supply at each emplacement, and in providing additional means of lighting gun platforms, carriages, and sights for night practice. For these improvements, divided among 1,297 different emplacements, an estimate of \$942,500 is submitted. The average cost per emplacement is seen to be only about \$725.

Range and position finders.—During the year satisfactory progress has been made. The utmost harmony has existed between the Chief of Engineers, the Chief of Ordnance, the Chief Signal Officer, and the Chief of Artillery, all of whose departments are involved in the work. The horizontal-base system of position finding has recently been adopted by the Artillery, and Boards consisting of two traveling artillery members associated with the local artillery commanders and district engineer officers at each fortified harbor on the Atlantic and Gulf coasts have prepared the necessary schemes of base-end stations. When finally approved by the Chief of Artillery, the installation of the stations, instruments and cables will be conjointly prosecuted by the Chief of Engineers, the Chief Signal Officer, and the Chief of Ordnance.

Based on the plans of these Boards, it is estimated that the engineer work of installing fire-control stations and supplying the necessary electric light and power plants to operate them in batteries, which are now complete in all other respects, will require an appropriation of \$500,000.

Sites.—During the past year negotiations have been continued for the acquisition of 1 site at Narragansett Bay, and 1 at the eastern entrance to Long Island Sound. The acquisition of 1 site at Portland Harbor, Maine, of 1 site at Boston Harbor, and of tracts at the defenses of Washington, D. C., Hampton Roads, Virginia, Savannah, Ga., and New Orleans, La., was completed during the year. In addition, negotiations have been entered into for the acquisition of tracts at the defenses of the Kennebec River, Maine; Charleston, S. C.; Mobile, Ala.; the Columbia River, and Puget Sound.

A number of sites still remain to be acquired to carry out the approved projects of seacoast defenses, and an estimate of \$650,000, including a special estimate for Cushing Island, Portland Harbor, Maine, is submitted to continue the work. The most important of the sites still to be acquired is the one at the southern entrance to New York Harbor, rendered necessary by the new deep-water entrance now under construction.

Searchlights and electrical connections.—The fortification appropriation acts approved June 6, 1902, March 3, 1903, and April 21, 1904, each appropriated \$150,000 for the installation of searchlights in seacoast defenses. Under these appropriations searchlights and the means to operate them have been provided so far as the funds would permit.

It is especially important that systematic installation of searchlight apparatus for night defense should be continued. Experience has shown that economy in installation and the keeping of electric plants in good order in time of peace are promoted by habitually using fortification plants for post illumination.

For continuing searchlight installation, an estimate of \$500,000 is submitted and is recommended for special consideration as being urgently necessary.

Preservation and repair of fortifications.—The operations under this appropriation have consisted during the fiscal year in the preservation of engineer material in new batteries, the application of remedial measures for reducing the dampness in some magazines in the earlier works and the repair and improvement of the ammunition service. The mechanical and electrical appliances in modern batteries demand unremitting attention to prevent deterioration and damage under the destructive influence of the moist sea air. The new works already constructed represent an expenditure of approximately \$28,000,000 for engineering work alone. With the \$300,000 provided for by the act of April 21, 1904, for works of preservation and repair it will be possible to remedy many incipient leaks and other defects, as well as to keep the iron work and apparatus for ammunition service well painted and free from rust. It is strongly recommended that an appropriation of the same sum be again made this year, as the needs are great and the number of separate batteries, etc., requiring attention and care is constantly increasing.

Supplies for seacoast defenses.—The acts of May 25, 1900, March 1, 1901, and June 6, 1902, each appropriated the sum of \$25,000, and those of March 3, 1903, and April 21, 1904, each \$35,000, for tools and electrical and engine supplies for use of the troops for maintaining and operating light and power plants in gun and mortar batteries. This is designed to enable the Engineer Department to meet the require-

ments of paragraph 382, Army Regulations, prescribing the articles which are to be supplied by the Engineer Department to the Coast Artillery for the service of the batteries. Requisitions are made directly upon the Chief of Engineers, and authorized articles are purchased and issued by district engineer officers with as little delay as possible. This system has proved satisfactory.

During the past two years the completion and transfer of electric plants to the troops has continued, and the demand for supplies necessary to operate such plants has correspondingly increased. It is now found that \$40,000 will be required for the purchase of these supplies for the next year, and an estimate of that amount is submitted.

Sea walls and embankments.—The act of March 3, 1903, appropriated \$89,575 and that of April 21, 1904, \$99,000 for the construction of sea walls and embankments, which has been applied to the construction of sea walls at fortifications for the defense of the eastern entrance to Long Island Sound, New York Harbor, Delaware River, Baltimore, Md., Hampton Roads, Virginia, Cape Fear River, North Carolina, Charleston, S. C., Tampa, Fla., Pensacola, Fla., Mobile, Ala., and New Orleans, La.

Based upon reports of district engineer officers showing the necessity for their construction, an estimate of \$300,000 is submitted for the construction of sea walls and embankments at a number of additional localities.

Submarine mines.—With few exceptions all harbors are now equipped with torpedo storehouses, many of them of a temporary character, cable tanks, and serviceable mining casemates. Many of the last named are not of the latest type, and according to artillery officers are of insufficient size to accommodate the latest types of operating machinery and apparatus. As funds become available they will be replaced by more convenient and commodious casemates. Based on a list of new casemates, cable tanks, storehouses, and loading rooms prepared by the Artillery Torpedo Board, and by them stated to be urgently needed to permit the artillery troops to be effectively trained in the use of submarine mines, an estimate is submitted for \$600,000, to be expended under the Engineer Department. The purchase of torpedo material proper, such as cables, cases, floating plant, etc., was, by act of June 6, 1902, assigned to the Artillery Corps, and the construction of the buildings, casemates, cable galleries, and cable tanks left with the Corps of Engineers.

By the army-reorganization act of February 2, 1901, the torpedo defense of the seacoast devolved upon the artillery troops. The apparatus has been transferred, in accordance with the provisions of this act, at all localities at which there was an artillery post in the vicinity. At the few points where torpedo material has remained in the charge of this Department it has been maintained in condition for prompt use.

Defenses of insular possessions.—Preparation of preliminary projects for emergency defenses of the more important harbors in the new insular possessions was continued. Accurate surveys of a large number of battery sites were completed so that as funds become available actual construction may follow, the rate of progress being solely dependent on the wishes of Congress, as expressed by the size of appropriations. With the approval of the Secretary of War, funds appropriated by the last fortification appropriation act have been applied in the Philippine Islands to constructing heavy batteries which

are costly and slow to build, leaving till later the lighter batteries, which, in emergency, could be rapidly completed and armed.

For the construction of gun and mortar batteries in the insular possessions, an estimate of \$2,000,000 is submitted, as being a sum which can be advantageously and economically handled by the engineer organization now employed in the construction of batteries in the Tropics.

Last year the Chief of Engineers submitted an estimate of \$526,100 for the acquisition of land for fortification purposes in the Hawaiian Islands. The amount appropriated for this purpose was \$200,000. Negotiations are now under way for the acquisition of so much of the land needed as can be secured with the funds in hand. It is considered of importance, and in the interest of economy, that all sites should be secured at the same time, and the appropriation of the remaining \$326,100 for this purpose is recommended.

The following money statements show the condition of all general appropriations under which operations were in progress at the close of the fiscal year:

"GUN AND MORTAR BATTERIES."

For battery construction.

June 30, 1904, balance unallotted.....	\$373, 661. 20
June 30, 1904, pledged for batteries for which the plans were not finally approved	301, 600. 00
June 30, 1904, balance available for miscellaneous work.....	72, 061. 20

For installation of range and position finders.

June 30, 1904, balance unallotted.....	\$179, 071. 38
June 30, 1904, pledged for work for which plans were not finally approved	25, 814. 90
June 30, 1904, balance available for installation of fire-control systems as the schemes therefor are approved by the Chief of Artillery.....	153, 256. 48

"SITES FOR FORTIFICATIONS AND SEACOAST DEFENSES."

June 30, 1904, balance unallotted.....	\$207, 397. 29
June 30, 1904, specifically pledged for sites, the acquisition of which has been approved by the Secretary of War.....	117, 000. 00
June 30, 1904, balance available for the contemplated acquisition of additional land.....	90, 397. 29

"SEARCHLIGHTS FOR HARBOR DEFENSES."

June 30, 1904, balance unallotted.....	\$50, 350. 00
June 30, 1904, pledged.....	50, 350. 00

"PRESERVATION AND REPAIR OF FORTIFICATIONS."

June 30, 1904, balance unallotted.....	\$249, 894. 70
June 30, 1904, pledged.....	241, 179. 82
June 30, 1904, balance available.....	8, 714. 88

"PLANS FOR FORTIFICATIONS."

June 30, 1904, balance unallotted.....	\$5, 000. 00
June 30, 1904, pledged.....	5, 000. 00

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"SUPPLIES FOR SEACOAST DEFENSES."

June 30, 1904, balance unallotted.....	\$12, 306. 91
June 30, 1904, pledged for later allotments.....	11, 236. 30
June 30, 1904, balance available.....	1, 070. 61

"SEA WALLS AND EMBANKMENTS."

June 30, 1904, balance unallotted.....	\$34, 500. 00
June 30, 1904, pledged.....	34, 500. 00

"CASEMATES, GALLERIES, ETC., FOR SUBMARINE MINES."

June 30, 1904, balance unallotted.....	\$87, 000. 00
June 30, 1904, pledged.....	87, 000. 00

"FORTIFICATIONS IN INSULAR POSSESSIONS."

For construction of seacoast batteries.

June 30, 1904, balance unallotted.....	\$700, 000. 00
June 30, 1904, pledged.....	700, 000. 00

For sites, Hawaiian Islands.

June 30, 1904, balance unallotted.....	\$200, 000. 00
June 30, 1904, pledged.....	200, 000. 00

ESTIMATES OF APPROPRIATIONS REQUIRED FOR 1905-6.

Fortifications.

For gun and mortar batteries:	
For construction of gun and mortar batteries.....	\$4, 000, 000
For modernizing older emplacements.....	942, 500
For installation of range and position finders.....	500, 000
	<u>\$5, 442, 500</u>
For sites for fortifications and seacoast defenses.....	650, 000
For searchlights for harbor defenses.....	500, 000
For protection, preservation, and repair of fortifications.....	300, 000
For preparation of plans for fortifications.....	5, 000
For supplies for seacoast defenses.....	40, 000
For sea walls and embankments.....	300, 000
For casemates, galleries, etc., for submarine mines.....	600, 000
For defenses of insular possessions:	
For construction of seacoast batteries.....	\$2, 000, 000
For procurement of land for sites for defenses of the Hawaiian Islands.....	326, 100
	<u>2, 326, 100</u>
Total.....	10, 163, 600

ENGINEER SCHOOL.

Commandant, Maj. Edward Burr, Corps of Engineers, during the entire year.

The instruction of officers at the school was suspended during the year by the Secretary of War upon the recommendation of the Chief of Engineers and with the approval of the War College Board, and this suspension has been continued for another year for the same reasons as led to the first action in this matter. The instruction of enlisted

men and the other duties assigned to the school have, however, been continued uninterruptedly.

A statement of the methods of the school will be found in the Annual Reports of the Chief of Engineers for 1902 and 1903. Much consideration was given during the year to matters relating to the instruction of engineer officers at the Engineer School and in garrison schools, and much of the results of this work will be found in recent orders of the War Department relating to these schools.

The equipment of the school was continued during the year in preparation for the resumption of instruction, and additions were made in all departments, including the library, printing office, laboratories, shops, etc.

In addition to their regular work, much was accomplished along other lines by officers on duty at the school, including the engineer equipment of troops, the improvement of the bridge equipage, technical researches, and the circulation of information of technical interest.

ENGINEER DEPOT, WASHINGTON BARRACKS, D. C.

In the charge of Maj. Edw. Burr, Corps of Engineers, during the entire year.

The Engineer Depot, located at Washington Barracks, D. C., is the repository of miscellaneous engineering tools and materials for ponton and bridge equipage, engineer equipments of all sorts, instruments, and reconnaissance supplies for surveying and astronomical work upon which the Corps of Engineers may be engaged.

The depot has been largely employed during the year in the purchase and issue of equipments for engineer troops, repair and construction of ponton and bridge materials, purchase of various intrenching tools, purchase, repair, and issue of surveying and other instruments, and in the care and preservation of a large number of tools, implements, and instruments brought here from Willets Point, N. Y., in 1901 and 1902, and additions made since by purchase.

Property has been cared for as well as the limited storage facilities would permit. Storage room was provided in a number of old brick and frame buildings, and by providing temporary protection in the open air. A number of temporary sheds and roofs were provided for from old materials on hand until better storage room can be provided under the reconstruction of the post. Suitable and ample storage facilities are urgently needed.

Minor repairs have been made to a number of the engineering models pertaining to the Engineer Museum, and some of them were sent to the Louisiana Purchase Exposition at St. Louis, Mo.

Additions have been made to the advance and reserve guard ponton equipage. It has become necessary to substitute Oregon fir for clear white pine. Enough materials were bought to fit out two divisions of each advance guard and reserve ponton equipage, except ponton boats for the second division, and wagons for both divisions.

Satisfactory facilities were inaugurated for receiving and shipping engineering supplies and surveying instruments.

The details of the work of the depot will be found in the report of the officer in charge.

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STATEMENT OF FUNDS.

I. For Engineer Depots, fiscal year ended June 30, 1903:		
July 1, 1903, balance unexpended		\$633. 36
June 30, 1904, expended during fiscal year.....	\$617. 73	
June 30, 1904, turned into the Treasury	15. 63	
		<u>633. 36</u>
II. For Engineer Depots, 1904:		
Amount allotted for fiscal year ended June 30, 1904, for Inci-		
dentials and Instruments.....		9, 895. 43
June 30, 1904, expended during fiscal year.....	\$9, 330. 17	
June 30, 1904, amount pledged.....	565. 14	
June 30, 1904, amount to be turned into Treasury..	. 12	
		<u>9, 895. 43</u>
III. Engineer School, Washington, D. C., fiscal year ended June 30, 1903:		
July 1, 1903, balance unexpended.....		25, 086. 13
June 30, 1904, expended during fiscal year.....	\$25, 000. 28	
June 30, 1904, turned into the Treasury	85. 85	
		<u>25, 086. 13</u>
IV. Engineer School, Washington, D. C., 1904:		
Amount appropriated for fiscal year ended June 30, 1904		25, 000. 00
June 30, 1904, expended during fiscal year.....	\$23, 291. 57	
June 30, 1904, amount pledged	1, 708. 39	
June 30, 1904, amount to be turned into Treasury..	. 04	
		<u>25, 000. 00</u>
V. Engineer Equipment of Troops, fiscal year 1903:		
July 1, 1903, balance unexpended of all allotments		2, 899. 63
June 30, 1904, expended during fiscal year.....	\$2, 899. 53	
June 30, 1904, amount turned into the Treasury..	. 10	
		<u>2, 899. 63</u>
VI. Engineer Equipment of Troops, 1904:		
Total of allotments made for the fiscal year ended June 30, 1904..		10, 464. 20
June 30, 1904, expended during fiscal year.....	\$8, 198. 76	
June 30, 1904, amount pledged.....	2, 265. 31	
June 30, 1904, amount to be turned into the Treas-		
ury	. 13	
		<u>10, 464. 20</u>
VII. Emergency Fund, War Department, act of March 3, 1899, for "Equip-		
ment of Electrical Laboratory at Engineer School, Washington		
Barracks:"		
July 1, 1903, balance unexpended		1, 010. 92
June 30, 1904, expended during fiscal year.....	\$975. 57	
July 1, 1904, balance unexpended	35. 35	
		<u>1, 010. 92</u>
VIII. Examinations, Surveys, and Contingencies of Rivers and Harbors,		
for "Purchase and Repair of Instruments:"		
July 1, 1903, balance unexpended.....		8. 60
June 30, 1904, amount allotted during fiscal year.....		273. 02
		<u>281. 62</u>
Total.....		281. 62
June 30, 1904, expended during fiscal year.....	\$8. 60	
June 30, 1904, amount pledged.....	83. 25	
July 1, 1904, balance unexpended and available..	189. 77	
		<u>281. 62</u>
IX. Gun and Mortar Batteries, act of June 6, 1902, for "Purchase and		
repair of instruments:"		
June 25, 1904, amount allotted		405. 77
June 30, 1904, amount pledged.....		399. 50
		<u>6. 27</u>
July 1, 1904, balance unexpended and available.....		6. 27

NEW APPROPRIATIONS.

I. For Engineer Depots for fiscal year ending June 30, 1905, the following amounts were allotted by the Chief of Engineers, United States Army, for disbursement at Washington Barracks, D. C., viz:	
1. For "Incidentals".....	\$8,000.00
2. For "Instruments".....	5,000.00
3. Engineer Equipment of Troops, 1905.....	\$13,000.00
II. For Engineer School, Washington, D. C., 1905, for "Equipment and Maintenance of the Engineer School of Application at Washington Barracks, D. C.".....	13,000.00
III. For Gun and Mortar Batteries, act of April 21, 1904, for "Purchase of Articles of Engineer Equipment".....	25,000.00
	a 4,600.00
Total	
	55,600.00

ENGINEER DEPOT, FORT LEAVENWORTH, KANSAS.

This depot is maintained for the purpose of storing and issuing supplies for the First Battalion of Engineers, and for the storage, repair, and manufacture of surplus ponton materials. It is under the charge of Maj. Smith S. Leach, Corps of Engineers, commanding First Battalion of Engineers.

During the year additional ponton material has been purchased and repairs have been made to that on hand. Numerous experimental constructions have been made and tested, having in view necessary improvements to the engineer equipment.

The reproduction of plates in connection with the Engineer Field Manual has also been in progress.

The operations of the depot have included the purchase of photographic and drafting supplies, tools and supplies for the First Battalion of Engineers, and the purchase and manufacture of equipment for the engineer shop of instruction.

Details of expenditures are shown in the report of the officer in charge.

ENGINEER DEPOT, NEW YORK CITY.

Officer in charge during the fiscal year, Capt. Edward H. Schulz, Corps of Engineers.

During the year purchases of engineering supplies of all kinds were made for the engineer equipment of troops and for the equipment of officers' schools, military posts; and instruments were purchased and repaired for use of engineer officers in charge of districts, and division and department engineers.

During June, 1904, in accordance with instructions received from the Chief of Engineers, the unexpended balances of funds from the different appropriations, and all property and records, were transferred to the Engineer Depot, Washington Barracks, D. C., and this depot was discontinued on June 30.

^a To be reimbursed from appropriation for "Arming and Equipping the Organized Militia."

Six each of the two types of Williams-Mitchell sketching cases were manufactured during the year, and two of each type were issued to each of the three battalions of engineers for test.

One Bower sketching case was manufactured with modifications, and issued to the First Battalion of Engineers, Fort Leavenworth, Kans., for test.

The total number of instruments repaired and average cost of same were as follows:

	Total cost.	Average cost.
10 transits.....	\$423.12	\$42.31
2 levels.....	58.00	29.00
1 sextant.....	33.40	33.40
1 plane table.....	28.50	28.50
86 miscellaneous instruments.....	386.25	4.49
Total.....	929.27	

Engineering and surveying supplies purchased and shipped during the fiscal year:

Engineer Depot, Washington Barracks, D. C.....	\$7,149.11
Philippine Islands.....	2,754.18
Three battalions of engineers.....	478.80
Divisions.....	329.46
Departments.....	308.37
General Staff.....	461.16
Engineer officers of posts.....	1,801.25
Militia.....	2,660.13
Total.....	15,942.46

I. Engineer Equipment of Troops, 1904:	
May 23, 1903, amount allotted.....	\$7,000.00
December 12, 1903, amount allotted.....	356.37
February 19, 1904, amount allotted.....	1,500.00
June 30, 1904, amount expended during fiscal year.....	8,856.37
II. Engineer Depots, 1904—"Instruments:"	
May 23, 1903, amount allotted.....	4,500.00
December 12, 1903, amount allotted.....	277.97
June 30, 1904, amount expended during fiscal year.....	4,777.97
III. Engineer Depots, 1904—"Incidentals:"	
May 23, 1903, amount allotted.....	500.00
June 30, 1904, amount expended during fiscal year.....	500.00
IV. Examinations, Surveys, and Contingencies of Rivers and Harbors— "Purchase and Repair of Instruments:"	
July 1, 1903, balance unexpended.....	448.02
June 28, 1904, amount deposited to credit of Treasurer United States.....	273.02
June 30, 1904, amount expended during fiscal year.....	175.00
V. Gun and Mortar Batteries, act of June 6, 1902—"Purchase and Repair of Instruments:"	
July 1, 1903, balance unexpended.....	508.27
June 28, 1904, amount deposited to credit of Treasurer United States.....	405.77
June 30, 1904, amount expended during fiscal year.....	102.50
VI. Equipment of Officers' Schools, Military Posts, 1903 and 1904:	
October 19, 1903, amount allotted.....	5,000.00
June 30, 1904, amount expended during fiscal year.....	5,000.00

ESTIMATES OF APPROPRIATIONS REQUIRED FOR THE ENGINEER DEPOTS
FOR 1905-6.

For incidental expenses of the depots, including fuel, lights, chemicals, stationery, hardware, machinery, pay of civilian clerks, mechanics, and laborers, extra-duty pay to soldiers necessarily employed for periods not less than ten days as artificers on work in addition to and not strictly in the line of their military duties, such as carpenters, blacksmiths, draftsmen, printers, lithographers, photographers, engine drivers, telegraph operators, teamsters, wheelwrights, masons, machinists, painters, overseers, laborers, repairs of, and for materials to repair, public buildings, machinery, and unforeseen expenses	\$11,500
For purchase and repair of instruments, to be issued to Officers of the Corps of Engineers and to officers detailed and on duty as acting engineer officers for use on public works and surveys	5,000
Total	16,500

ENGINEER EQUIPMENT OF TROOPS AND CIVILIAN
ASSISTANTS TO ENGINEER OFFICERS.

By act of Congress approved March 2, 1903, the sum of \$25,000 was appropriated for the engineer equipment of troops in the field, for the procurement of ponton trains, intrenching tools, instruments, drawing materials, etc., and the sum of \$25,000 for civilian assistants to engineer officers serving on the staffs of division, corps, and department commanders, to enable them to secure the services of surveyors, draftsmen, photographers, master laborers, and clerks. Both appropriations were limited to the fiscal year 1904.

With the funds appropriated for the purposes above stated, engineering supplies were furnished, mainly through the United States Engineer Depots, for the various military divisions and departments in the United States and the Philippines; the engineer battalions were fitted out with materials called for in approved outfits for engineer companies; a number of experiments were made with intrenching tools and reconnaissance instruments; materials and supplies for ponton trains were procured; parts of the Engineer Field Manual were prepared for the printer, and the several officers attached to the military divisions and departments have been supplied with the necessary civilian assistants. The sum of \$23,971.77 was allotted from the equipment appropriation, and a balance of \$1,028.23 reverted to the Treasury. From the appropriation for civilian assistants \$23,152.10 was allotted, and a balance of \$1,847.90 reverted to the Treasury.

The army appropriation act of April 23, 1904, provided \$25,000 for the engineer equipment of troops and \$25,000 for civilian assistants to engineer officers for the fiscal year ending June 30, 1905. The sum of \$25,000 each is requested for engineer equipment of troops and for civilian assistants to engineer officers for the next fiscal year.

For details of expenditures under the appropriation for engineer equipment of troops see Appendixes Nos. 2, 3, and 4.

* * * * *

ESTIMATE FOR AMOUNT REQUIRED FOR MAPS, INCLUSIVE OF WAR MAPS.

For publication of maps for use of the War Department, inclusive of war maps, \$5,000.

Paragraph 393 of the Army Regulations requires that the commanding officer of each post where there are fixed batteries bearing upon a

**SURVEY FOR WAGON ROAD FROM VALDES TO FORT EGBERT, ALASKA,
1904 AND 1905, AND SURVEY FOR MILITARY TRAIL BETWEEN YUKON
RIVER AND COLDFOOT, ALASKA, 1904 AND 1905.**

Surveys for the above road and trail were provided for in the army appropriation act of April 23, 1904. The duty of making the surveys and estimates was assigned to Maj. John Millis, Corps of Engineers, U. S. Army, stationed in Seattle, by telegram of May 13, 1904, and by letter of the same date.

The Valdes-Fort Egbert road will be some 400 miles long, and the Yukon-Coldfoot trail will be in the neighborhood of 90 miles long.

Coldfoot is on the headwaters of the Koyukuk, within the Arctic Circle, in latitude 67° 20' north.

Five parties were organized in Seattle to make the surveys. One for the Coldfoot trail and four for the Valdes-Fort Egbert road. The Coldfoot party and two of the Valdes-Fort Egbert parties sailed from Seattle on May 31 for Skagway, from which point they were to go by the White Pass Railroad and the Yukon River to the points of beginning their respective surveys. Two other parties sailed from Seattle on June 1 for Valdes.

When last heard from the Coldfoot party had nearly reached Fort Hamlin on the Yukon River, from which point the survey was to begin.

Two of the Valdes-Fort Egbert parties had reached Fort Egbert and had presumably begun work, while the two other parties were in the field working along the line of the road from Valdes. It is expected to complete all the surveys during the present season.

VALDES-FORT EGBERT SURVEY.

Amount appropriated in army appropriation act of April 23, 1904.....	\$25,000.00
June 30, 1904, amount expended during fiscal year for survey.....	5,068.35
July 1, 1904, balance unexpended	19,931.65
July 1, 1904, outstanding liabilities	7,977.10
July 1, 1904, balance available.....	11,954.55

YUKON-COLDFOOT SURVEY.

Amount appropriated in army appropriation act of April 23, 1904.....	\$2,500.00
June 30, 1904, amount expended during fiscal year for survey.....	134.45
July 1, 1904, balance unexpended	2,365.55
July 1, 1904, outstanding liabilities	1,702.93
July 1, 1904, balance available.....	662.62
* * * *	

Very respectfully,

A. MACKENZIE,
Brig. Gen., Chief of Engineers,
U. S. Army.

Hon. WILLIAM H. TAFT,
Secretary of War.

REPORT OF THE CHIEF OF ORDNANCE.

REPORT OF THE CHIEF OF ORDNANCE.

OFFICE OF THE CHIEF OF ORDNANCE,
UNITED STATES ARMY,
Washington, October 27, 1904.

SIR: I have the honor to submit the following report on the principal operations of the Ordnance Department during the past year, together with certain remarks as to its interests and necessities:

WORK OF ORDNANCE ESTABLISHMENTS.

The Ordnance Department is charged with the duty of designing, manufacturing, and otherwise procuring, and of supplying to the service, and maintaining in repair the artillery, small arms, ammunition, and personal and horse equipments for the fixed defenses and the mobile armies and militia of the United States and its insular possessions; and by authorization supplies, also, practically all of the small arms and equipments of the Navy and the Marine Corps. In this work it employs over 5,000 workmen in six great establishments, which are guarded and generally cared for by 700 enlisted men. Much of the work of the Department is of a scientific character, involving the application of the sciences of chemistry, mechanics, and electricity; the amount of this class of work is difficult to set forth accurately, but it will help in forming an estimate of it to know that of the high-class aids to such work known as draftsmen, who translate theoretical study into the specification and illustration which precede production, there are employed 61. An imperfect general measure of the work of a department of construction and supply is furnished by the amount of funds which is expended by the Department in carrying the work on. For the last four years this amount has averaged for the Ordnance Department over \$13,000,000 annually, or more than \$187,000 per officer. As the work has been done by practically the entire corps the latter figures give a kind of representation of the amount of responsibility which has, on the average, fallen to each officer, expressed financially.

The present establishments of the Ordnance Department, with their location and uses, are as follows:

Watertown, Mass., manufacturing arsenal.

Springfield, Mass., manufacturing armory.

Watervliet, N. Y., manufacturing arsenal.

Governors Island, N. Y., arsenal of storage, issue, and purchase.

Sandy Hook, N. J., proving ground.

Dover, N. J., powder depot.

Philadelphia, Pa., manufacturing arsenal.

Augusta, Ga., arsenal of storage and repair.

Rock Island, Ill., manufacturing arsenal.

San Antonio, Tex., arsenal of storage and repair.

Benicia, Cal., arsenal of storage and repair.

All of them are used for the issue of supplies, and all of the manufacturing arsenals are also arsenals of storage and repair.

The principal although not the sole manufacture of each of the manufacturing establishments is as follows: Of the Watertown Arsenal, seacoast gun carriages; of the Springfield Armory, small arms; of the Watervliet Arsenal, cannon, large and small; of the Frankford Arsenal (Philadelphia, Pa.), ammunition for small arms and mobile artillery; of the Rock Island Arsenal, personal and horse equipments, carriages for mobile artillery, and small arms. All of the muskets, small-arm ammunition, and personal and horse equipments required for the Army are manufactured by the Department, but of other classes of ammunition and small arms, of small cannon, and of gun carriages a considerable proportion of the requirements of the service is supplied by private establishments.

At the invitation of the American Society of Civil Engineers the following papers, showing the progress made in this country during the last decade in the science and art of different branches of ordnance engineering, were prepared by officers of this Department for the International Engineering Congress, held October 3 to 8, at the Louisiana Purchase Exposition, viz: Capt. John T. Thompson, small arms; Capt. George W. Burr, mobile artillery; Capt. Odus C. Horney, seacoast guns; Capt. Thales L. Ames, ammunition for cannon; Capt. Edward P. O'Hern, seacoast gun-carriage design and construction.

PERSONNEL.

In my previous reports I have invited attention to the disadvantageous condition of the Department in regard to its personnel. I must now repeat the statement that the Department can not do its work with its present force of officers. Those who are now carrying on the operations of the Department are worked to such an extent as to interfere with the quality of their product, and the quantity and character are below what is necessary if the Department is to do what is expected of it. The present authorized strength, 71 officers, is less than the number which it is thought can be readily shown to be necessary, and there is a shortage of 16 officers below the number authorized. Officers of the ability needed and called for by the character of the examinations exist in quite sufficient numbers in the service, but there is no inducement to tempt them to fit themselves for duty in the Ordnance Department, and to perform the arduous work consequent upon service therein. If such legislation is not enacted as will enable the Department to stimulate and utilize the talent which exists in the service, either civilian engineers of proper attainments, at corresponding salaries, must be employed or the financial resources of the Department must be so expended as to bring into existence a properly skilled corps of experts in the employ of private manufacturers.

The consequence of the present condition is that notwithstanding the devoted efforts of its officers the business of the Ordnance Department is now carried on with only fair efficiency. In every case of lapse, investigation leads ultimately back to the same cause, lack of officers.

The engineering and designing work is lagging badly; much is being pursued, but much is also being left undone. To the eye of responsible concern the latter presents disquieting prominence.

A measure of relief has been submitted by the undersigned and, after modification resulting from discussion, has been approved by the General Staff, the Chief of Staff, and the Secretary of War. With some further modification it is now before the Senate with favorable report from the Committee on Military Affairs of that body. It is hoped that it may speedily become law.

FISCAL AFFAIRS.

The fiscal resources and expenditures of the Department during the year were as follows:

Amount in the Treasury to credit of ordnance appropriations on July 1, 1903.....	\$11,010,045.84
Amount deposited in the Treasury on account of the Ordnance Department, but not credited to ordnance appropriations, on July 1, 1903..	36,315.78
Amount in United States depositories to credit of disbursing officers under ordnance appropriations on July 1, 1903	1,554,354.36
Amount of appropriations made for the fiscal year ending June 30, 1904, including the amount of those contained in the act making appropriations for fortifications and other works of defense, etc., approved April 21, 1904, under control of the Ordnance Department..	10,245,613.41
Amount refunded during the fiscal year ended June 30, 1904, to ordnance appropriations by Treasury settlements, on account of transfers of property to the various bureaus and Executive Departments, to the organized militia, etc.....	2,245,885.16
Amount received during the fiscal year ended June 30, 1904, from sales of ordnance and ordnance stores; from collections from troops on account of loss of or damage to ordnance stores; from Chicago, Rock Island and Pacific Railroad Company on account of maintenance of Rock Island Bridge; proceeds arising from tests made by the Government testing machine at Watertown Arsenal, and from other sources not before mentioned	162,535.30
Total	25,254,749.85
Amount disbursed by disbursing officers from ordnance appropriations during the fiscal year ended June 30, 1904.....	9,657,329.54
Amount paid and transferred by Treasury settlements during the fiscal year ended June 30, 1904, from ordnance appropriations on account of transfers of property from other Bureaus and Executive Departments to the Ordnance Department, and of payment to contractors for certain purchases, etc.....	100,231.33
Amount deposited in the Treasury during the fiscal year ended June 30, 1904, and credited to "Ordnance material (proceeds of sales)"..	69,275.02
Amount covered into the Treasury under "Miscellaneous receipts" on account of proceeds of Government property during the fiscal year ended June 30, 1904.....	3,479.48
Amount covered into the "Surplus fund" of the Treasury on June 30, 1904	71,203.54
Amount in United States depositories to credit of disbursing officers under ordnance appropriations on June 30, 1904.....	1,585,583.72
Amount deposited in the Treasury on account of Ordnance Department, but not credited to ordnance appropriations, on June 30, 1904..	11,694.49
Amount in Treasury to credit of ordnance appropriations on June 30, 1904.....	13,755,952.73
Total	25,254,749.85

The above statement comprises not only the appropriations made exclusively for the service of the Ordnance Department, but also those made for experiments conducted under the direction of the Board of

Ordnance and Fortification, and for the purchase of submarine mines the control of which rests with the Chief of Artillery. These appropriations are entitled "Board of Ordnance and Fortification" and "Submarine mines," and the amounts appropriated under each heading at the last session of Congress was \$100,000. A record of the amounts appropriated, allotted, remitted, and expended under each of these appropriations is kept on the books of the Ordnance Office; in the case of the appropriation "Submarine mines," the disbursements made under it receive the administrative action of this office, but for the appropriation "Board of Ordnance and Fortification," such administrative action is only had on disbursements under allotments made specifically for expenditure through the Ordnance Department.

TRANSFERS OF ORDNANCE STORES TO THE EXECUTIVE DEPARTMENTS AND THE ORGANIZED MILITIA OF THE SEVERAL STATES.

The value of stores thus transferred is refunded to ordnance appropriations by Treasury settlements on presentation of evidence showing the transfer. The value of the stores transferred to the Navy for which this Department was reimbursed amounted to \$205,669.69; to the Marine Corps, \$42,996.17; to the other Executive departments, \$9,940.32, and to the organized militia, \$1,930,912.66. In conducting experiments for the Board of Ordnance and Fortification, the value of the ordnance stores which were used in them amounting to \$26,541.69 was transferred from the appropriations for the Board to the ordnance appropriations proper. The total amount by which ordnance appropriations were credited on account of Treasury settlements amounted to \$2,245,885.16, as shown in the statement. This amount is equivalent to very nearly 25 per cent of the amount appropriated for this Department and shows that the work of the Department for other objects than those of arming, equipping, and supplying the regular Army was nearly 25 per cent of the latter—measuring the work done by the money available for it. This does not take into consideration sales to the Philippine civil government and direct sales to the organized militia, which do not appear in Treasury settlements.

DISPOSITIONS OF FUNDS RECEIVED FROM TRANSFERS, SALES, ETC.

Prior to April 23, 1904, the proceeds arising from transfers and sales of serviceable ordnance stores were credited to the several appropriations out of which they were procured, except in cases of transfers to the militia authorized by section 1661, Revised Statutes, the cost of which was credited to the appropriation for the "Manufacture of arms." By the act of Congress approved April 23, 1904, it is authorized that all funds arising from such transfers and sales authorized by law shall be credited to one fund, which has been denominated, "Replacing ordnance and ordnance stores," which shall be available throughout the year in which the transaction was effected and the following year, to replace the supplies transferred or sold. This provision of law applies not only to Treasury settlements, but also to sales which result in depositing the proceeds in the Treasury.

DISBURSEMENTS.

The disbursement made directly by disbursing officers and the payments made by Treasury settlements from ordnance appropriations

amounted to \$9,757,560.87. The amounts of the disbursements made at the principal arsenals during the fiscal year and in the Ordnance Office are as follows:

Frankford Arsenal	\$1,784,064.74
Rock Island Arsenal.....	2,688,301.04
Sandy Hook proving ground	209,516.02
Springfield Armory.....	1,482,441.18
Watervliet Arsenal.....	705,165.93
Watertown Arsenal.....	660,471.27
Ordnance Office.....	1,366,131.39

AMOUNTS COVERED INTO THE SURPLUS FUND.

The principal amounts covered into this fund were \$12,878.54 under the appropriation for small-arms ammunition for the fiscal year 1902; \$9,392.81 under an appropriation for a magazine at the powder depot, which has been completed; \$15,000 under an appropriation of that amount for torpedo howitzers now of an obsolete type; \$2,500 appropriated July 23, 1892, for the expenses of a board to select a site on the Pacific coast for a gun factory, and \$12,231.63 under several appropriations for the armament of fortifications, the improvements in the design of material rendering the objects authorized no longer required.

COMPARISON OF THE FISCAL STATEMENT WITH THAT OF THE PRECEDING YEAR.

Comparing the fiscal statement with that of the preceding year, it will be found that the amount of the appropriations for the year was increased \$600,722.40, and the amount of disbursements and payments by \$536,179.50. The amount received on account of transfers to the Executive Departments and the organized militia increased from \$763,420.48 to \$2,245,885.16, a gain of \$1,482,464.48. This increase arose largely from the rearming and equipping of the militia. The increase of the amount available on June 30, 1904, for disbursement over that available July 1, 1903, amounting to \$2,751,464.62, arose from the increase of refundments by Treasury settlements and of appropriations and to a decrease of \$180,082.94 in the amount covered into the surplus fund of the Treasury.

SALES TO THE PHILIPPINE CIVIL GOVERNMENT.

In my last annual report I referred to an indebtedness of \$119,229.33 due this Department by the Philippine civil government on account of arms, ammunition, and equipments furnished it for the use of its constabulary. By a provision of law contained in the act of Congress approved April 23, 1904, that Government was relieved of this indebtedness and the account ordered closed.

REDUCTION OF APPROPRIATION HEADINGS.

In my last annual report I referred to the importance of a reduction in the number of appropriation titles under which this Department is compelled to account for the various expenditures made by it. Recommendations to this effect were made to the various committees of Congress which have supervision over the appropriations made for the Department, and the results have been partially successful. The number of appropriations for this Department which are generally made in the act for the support of the Army, excluding the appropri-

ations for the militia, were reduced from 10 to 7, and it is proposed to make recommendation to Congress with a view to making a further reduction. The number of appropriations contained in the act for fortifications and other works of defense were reduced from approximately 58 to 12, and the new appropriation titles cover objects which naturally should be classed together in order that Congress might have some idea, in a general sense, of the amounts expended for these purposes.

Briefly speaking, the new appropriations for armament of fortifications provide for specific appropriations for machine and automatic guns; for mountain, field, and siege guns, including their carriages; for seacoast guns and their carriages; for artillery target practice, etc. At the last session of Congress provision was made for fortifications in the insular possessions, and as Congress has chosen to provide for these separately, it has led to an increase in the number of appropriations, but there is no way of avoiding this increase. It was hoped that the Committee on Appropriations would look favorably upon a recommendation leading to accounting for all appropriations made for a specific object at the various arsenals under one heading, but this recommendation failed to meet with the approval of the committee. By consolidating estimates, as submitted to Congress, for the various objects at the arsenals, it was expected to reduce in this way the number of appropriation titles.

PAYMENT OF EMPLOYEES.

At the last session of Congress, on the recommendation of this Department, Congress enacted a provision of law providing for a uniform system of computing payments due employees drawing annual salaries. This remedied the difficulty referred to in my last annual report, wherein one class of employees of the Department was paid on one basis and another class on another basis.

PURCHASES.

During the last session of Congress a provision of law was enacted relieving this Department from reporting all open-market purchases under \$100. The same provision of law also authorized the Department to procure services in the open market up to and including \$200. This new provision of law saves considerable clerical work, which fulfilled no real purpose, and besides authorized the procurement of services, when the amounts were small, in a manner common among business men.

RECENT LEGISLATION AFFECTING DISPOSITION OF FUNDS ARISING FROM SALES OF SERVICEABLE ORDNANCE STORES.

In my last annual report it was shown how much clerical work was involved in crediting the numerous and various appropriations in this Department, when stores procured under these appropriations were transferred to Executive Departments, to the militia, etc. It was recommended to Congress that the funds arising from such transfers, as well as from sales, should constitute one fund on the books of the Treasury Department, and the following legislation was enacted by Congress:

Hereafter all moneys arising from disposition authorized by law and regulation of serviceable ordnance and ordnance stores shall constitute one fund on the books of the Treasury Department, which shall be available to replace ordnance and ordnance stores throughout the year in which the disposition was effected and throughout the following year.

This provision of law enables this Department to furnish supplies to any of the Executive Departments at any time during the fiscal year with the certainty that the value of the supplies will not be deducted from the sums which Congress has directed to be applied to the purposes of the War Department.

The importance of this legislation is further evidenced from the fact that from the date of its approval, namely, April 23, 1904, until June 30, 1904, the sum of \$190,935.72 was transferred to this fund. At the coming session of Congress recommendation will be made that not only funds arising from disposition referred to above shall be credited to this fund, but that all losses or damage to ordnance stores by railroad or transportation companies shall be credited to the same fund. It is obvious that when property is lost in transportation without having carried out the purpose for which Congress intended it, the money value of the same, when collected from the transportation company, should be used to replace the property so lost in order that the intent of Congress may be carried out.

BLANKS.

In my last annual report I referred to the importance of simplifying the blanks to be used in the executing and rendering of accounts for public funds. All the blanks in use by the Department for rendering money accounts, making reports in connection therewith, etc., have been prepared so that all of them can be executed on a typewriter in as many copies as may be desired. Instructions in each case have been printed on the back of each blank for the guidance of the person who may be called upon to execute them. This change has resulted in a reduction of fully 75 per cent in the amount of correspondence with the various disbursing officers of the Department concerning the execution and accomplishing of money vouchers and other papers.

EXAMINATION AND SETTLEMENT OF PROPERTY RETURNS IN THE ORDNANCE OFFICE.

The simplifications begun in 1899 in the manner of rendering the property returns and the methods of dealing with them in the Ordnance Office have produced their full effect in the last year, during which the work on back returns has been entirely completed. It has seen the last remnant of the volunteer returns settled, and has had to deal for the most part only with returns from the Regular Army, which are much less complicated than before, owing to the greater experience of the officers and the clearer definition of their responsibilities.

Dealing only with officers of the regular establishment, it became possible during the last year to apply more rigidly the penalties for failure to promptly render property returns and make explanation for errors, and rigidly enforcing stoppages of pay because of such neglect has resulted in much greater promptitude in the settlement of accountability.

In settling the final accounts of officers great benefit has resulted from the arrangement, long desired and recently effected with the Auditor, by which final accounts against an officer are not held open indefinitely, but the amounts not accounted for by him are deducted from his final pay and the responsibility balanced on the books of the office.

The reduction in clerical force has borne out the promise made at the time the improvements in methods were brought about. During 1899 the clerical force for this division amounted at one time to 52 clerks. This has now been reduced to 14.

During the last year this division of the office has for the first time had the benefit of the law providing, as recommended in report of Chief of Ordnance for 1900, for the rendition of returns semiannually instead of quarterly, reducing by over one-third the number of returns needing to be examined annually. This has been a relief both to the Ordnance Office and to officers rendering the returns. The returns rendered under this system are larger, but there is a saving of time on the whole because there are fewer totals to be carried forward, and it is practicable to examine all the returns received before the next returns come in.

In the report of the Chief of Ordnance for 1899, reference was made to the necessity for sacrificing the examination of returns to the demands of the work of the office, particularly to that of Manufacture and Supply, which could not be postponed. The nominal force of clerks in this division scarcely ever represented the number wholly engaged on returns. So many were drawn away for other work in the office that the clerk in charge could never count on the continued service of all the force. Repeated efforts were made to secure a permanent body, even if smaller in number, that would not be subject to frequent and unexpected calls to other work, and the beneficial results of such an arrangement were prophesied, but it was only during the last year that the more settled condition of affairs allowed this to be accomplished.

The report of the Chief of Ordnance for 1900 urged the abolition of boards of survey composed of several officers and the substitution of a survey officer corresponding to a field officer's court. The New Army Regulations have brought this about, and good results are anticipated from the change in reducing papers requiring examination in settling officer's returns.

In the same report the Chief of Ordnance recommended the simplification of papers relating to transfer of ordnance property when placed in the hands of detached soldiers sent from one station to another. This was adopted for the Medical Department the next year and for the Signal Corps soon after, and its application to the entire service has just been made a part of the Army Regulations. This avoids the transfer of formal receipts between officers when the destination of detachments is unknown, and saves delay in obtaining receipts as vouchers for the returns.

The field blanks, of pocket size, introduced by the Department in 1899, have proved of advantage to officers in campaigning, and several recommendations of the Department and its officers have tended to reduce delay and produce simplification. Particularly is this the case in the Philippines in giving the division commander power to make contracts, approve bills for printing and advertising, order sales of con-

demned property, and authorize transfer of stores between different departments or bureaus. All these changes make the adjustment of accountability more direct and simple.

At the end of the year only 251 returns remained unsettled, these settlements being delayed for want of proper explanation by officers rendering them, without which explanation it was impossible for this office to close them.

The work of the office as tabulated in the manner given in previous reports of the Chief of Ordnance is as follows:

	Number of returns not closed June 30, 1903.	Number of returns received.	Total.	Acted on during year.		Number of returns not closed awaiting correspondence June 30, 1904.
				Finally examined.	Closed.	
Arsenals and inspectors.....	20	52	72	54	61	11
Regular Army.....	3,431	5,986	9,417	8,408	9,177	240
Volunteer Army.....	12	4	16	4	14	
Spanish War Volunteers.....	2		2			
Total.....	3,465	6,042	9,507	8,466	9,256	251

CONDITION.

Awaiting final examination, June 30, 1903.....	2,424
Awaiting result of correspondence, June 30, 1903.....	1,041
Total.....	3,465
Awaiting final examination, June 30, 1904.....	None.
Awaiting result of correspondence, June 30, 1904.....	251
Total.....	251

DETAILED STATEMENT.

Closed.....	9,256
Examined.....	8,466
Settled by correspondence.....	790
Awaiting result of correspondence, June 30, 1903.....	1,041
Awaiting result of correspondence, June 30, 1904.....	251
Awaiting final examination, June 30, 1904.....	None.
Total.....	251

In the work of this division of the office very great assistance is derived from the practice of having a preliminary examination made at the Manila ordnance depot of all returns rendered by officers in the Philippines. This saves the delay of waiting until returns can be sent to Washington and there examined, leaving the officers long in doubt of the result of the examination, and it enables the Ordnance Department to correspond promptly with officers who make the returns and notify them of errors and omissions. It also relieves the Washington office of much of the routine work of examination, since the results are all outlined before the returns are received. In this way is hastened the settlement of accounts which would otherwise involve much difficulty. The following is a summary of the work done at the Manila ordnance depot under charge of the chief ordnance officer of the Philippines Division during the fiscal year.

Returns on hand July 1, 1903:	
Unexamined.....	773
Examined and held for correction.....	111
Examined and held for comparison.....	228
Total.....	1,112
Returns received during the fiscal year.....	1,630
Total.....	2,742
Returns sent to the Chief of Ordnance.....	2,207
Total on hand July 1, 1904.....	535
Total of these held for correction.....	82
Total of these held for comparison.....	423
Total number examined.....	30
Letters received.....	535
Letters sent.....	4,127
Indorsements sent.....	3,204
Indorsements received.....	1,536
	1,279

During the year this division was first under charge of Maj. L. L. Bruff, and later under charge of Maj. H. D. Borup, Ordnance Department, under both of whom the work of the office was continued, and to the energetic administration of the latter (since retired from the service at his own request) is due the final closing out of all back returns.

At the close of the year the reduction of work in the division, with the corresponding reduction of clerical force, has made it possible to transfer the property division back to the War Department building from the detached building previously occupied by it since 1898 at the corner of G and Eighteenth streets. The inconvenience of having the clerical force of the Ordnance Department separated has been pointed out in previous reports, and the consolidation will greatly simplify the work of this division in its relations with the other divisions of the office, though the room allowed is hardly enough for full efficiency.

SANDY HOOK PROVING GROUND.

The proving ground was commanded during the year by Lieut. Col. Charles S. Smith, Ordnance Department.

Firings for experimental and proof purposes have been conducted daily, weather permitting.

The following material received at the proving ground has been subjected to ballistic test:

- 29 lots of projectiles.
- 8 lots of shrapnel.
- 44 guns.
- 89 lots of powder.
- 7 lots of fixed ammunition.

The firings during the year have involved an expenditure of 154,660 pounds of powder, a total of 7,655 rounds having been fired.

The railroad, by means of which the proving ground is connected with all points outside, has proved a source of convenience and economy, confirming the original estimate as to the advisability of its purchase and maintenance.

In accordance with recommendation of a board of officers convened at Sandy Hook, N. J., November 5, 1903, an allotment of \$75,000 was

made by the Quartermaster-General for the construction of a new trestle on the narrow neck of land connecting the reservation with the mainland. The work has been taken up and the contract has been awarded for its construction, the work to be completed by November 15, 1904. About 400 feet of effective sidings have been provided and connections made with the old trestle at a point about 650 feet from the southern end. It is proposed to put this 650 feet of the old trestle in condition to be used as a freight siding.

As soon as the contemplated repairs to the sea wall have been made, the section of the old trestle which will have been converted into a freight siding can be filled in with sand and ballast and a grade track made. This can not be done until the sea wall is constructed, owing to the fact that at high water this section of the neck is overflowed. The total amount of freight shipped over this railroad during the year amounted to 24,087,404 pounds, requiring a total car movement of 627 cars. The total number of passengers carried during the year was 161,625.

Instruction of officers.—It has not been practicable during the year to specify regular hours for the instruction of officers in the school of application, owing to the requirements of other duties at the proving ground. The progress of the officers has, however, been satisfactory as far as it relates to their interest and zeal, and it is hoped that when the difficulties under which the Department is now laboring, owing to the lack of personnel, are removed plans looking to more systematic instruction may be consummated.

Machine-shop work.—The work for the officers in machine-shop practice is prescribed in orders, and each officer is expected to complete the work allotted during the year. When there has been a failure to meet the requirements of this work it has generally resulted from the assignment of other work interfering. Much interest has been taken in this work and the student officers have been much benefited by it.

Department of electricity.—All of the student officers do practically the same amount of work in this department during the year. The average per week was about three and one-half hours' study and one and one-half hours' practical work. For the ensuing year the practical work prescribed has been materially increased and the theoretical work slightly decreased. It is estimated that the new course will require about one hundred and fifty hours' study and three hundred hours' practical work, making an average of about nine hours' per week for the year.

Chemical laboratory work.—No complete schedule has been prescribed as yet for work of the student officers in the chemical laboratory. During the past year the chemical apparatus and the standard test of powders and explosives were explained and illustrated. The student officers also visited the works of the International Smokeless Powder and Chemical Company, at Parlin, N. J., where they were courteously received, and enjoyed an opportunity to witness the manufacture of smokeless powder in all its details. After becoming acquainted with the standard tests and acquiring practical efficiency in conducting them, officers are expected to engage in investigating work, for which the equipment of the laboratory at the proving ground is well adapted.

In the interior ballistic formulæ now available, the powder constants, such as the force of the powder, its co-volume, its rate of burning under atmospheric pressure, and the exponent of the power of the ratio of pressures in the expression of the rate of burning as a function of pressure have been combined into one or more general constants, whose values have been determined from normal ballistic data. These formulæ do not permit the separation and study in detail of the action of the constants enumerated above and hence do not give a satisfactory explanation of abnormal ballistic results. Capt. B. W. Dunn, of this Department, has been in charge of the chemical laboratory and has been assigned as a subcommittee of the Ordnance Board to the special duty of studying smokeless powders. He has developed formulæ which are designed to meet this deficiency and to permit an estimate of the effect of a change in any single condition in loading or in any well-defined characteristic of the powder. It is regretted that the limited personnel of this Department has not permitted the assignment of more officers to work exclusively in this field.

Shops.—The shops in this place, while primarily occupied in connection with proving-ground work, have in addition much work in the repair and alteration of the armament in the Central and Sandy Hook armament districts. It has been necessary during the year to add a few new tools and to employ additional mechanics. It is proposed, as soon as funds are available, to equip several machines in these shops with individual motors in order to save power which is now lost in driving line shafting when the machines are not in operation.

Proof battery.—A plan for changing the location of armor-plate backings and for improving the method of handling velocity screens is under consideration. It has been found essential to provide means for taking velocities when firing at plates, and to do this satisfactorily these backings must be moved farther from the emplacements. The plan contemplates two or three light railway tracks running parallel to the line of emplacements at the battery. Small cars will carry the velocity screens along the tracks to the position desired. The armor-plate backings will be located beyond the screens, and the runs which carry the chronograph wires will be placed underground to prevent their being cut by fragments of plate or shell.

New construction.—The new brick storehouse authorized by the fortification act approved June 6, 1902, and the brick magazine for fixed ammunition, authorized by the sundry civil act approved March 3, 1903, are under construction and will be completed during the year. The storehouse is located so as to provide for both railroad and cart transportation. The magazine will furnish store room for fixed ammunition, and a separate room is provided for the storage of fuzes and primers. Plans for the locomotive shed, authorized by the sundry civil act approved April 28, 1904, are now being prepared, and the erection of the building will be undertaken and completed during the year.

A shed has been erected for the storage of armor-piercing projectiles, and it is thought possible that a cover will also be required for the storage of other projectiles on hand at this place. Plans for the bombproof for the protection of observers on the firing range, and the observation range and plotting tower, authorized by acts of Congress, are now being prepared.

SMALL ARMS.

United States magazine rifle, model of 1903.—Immediately upon the approval by the Secretary of War, on June 19, 1903, of the adoption and manufacture of this arm, instructions were given to the commanding officer of Springfield Armory to make the necessary fixtures, tools, gauges, templets, etc., for the manufacture at that armory of 400 arms per day of eight hours, and for the manufacture at Rock Island Arsenal of 125 arms per day of eight hours. Sufficient fixtures, gauges, etc., were completed in the early part of the present calendar year to enable a daily output of 300 rifles to be obtained at the Springfield Armory, which output, it is anticipated, will be increased by November 1, 1904, to 400 per day. The greater part of the fixtures, gauges, etc., for the Rock Island Arsenal have been completed and installed, and the manufacture of rifles has begun. It is anticipated that a regular daily output of 125 arms will be obtained at the latter plant before June 30 next.

Upon the approval of the Chief of Staff, United States Army, the Corps of Cadets, U. S. Military Academy, West Point, N. Y., was equipped with the new rifle on March 23, 1904. As the cartridge for the new is different from that of the old rifle, it has been decided to make no other issues of the former arm, except in Alaska, China, and the Philippines, until a sufficient number have been completed to enable the entire Regular Army to be equipped at the same time. It is anticipated that this exchange of arms can be made in January next.

As the result of a series of tests, such minor details as the form of the striker point and the amount of its projection beyond the face of the bolt, the strength of the sear and main springs, and the twist of rifling have been determined; a number of minor changes have also been made in some of its parts.

The following appendages have been designed and will be furnished with the new rifle, namely: Muzzle and front sight cover, screw-driver and combined oiler and thong case. The latter is carried in a receptacle in the butt of the stock, one-half of the case contains oil and the other a thong and brush for cleaning the bore.

For the purpose of determining that twist which would give the greatest length of life of the barrel, consistent with accuracy and stability of the bullet, firings were conducted with barrels rifled with a uniform twist of one turn in 8, $8\frac{1}{2}$, 9, $9\frac{1}{2}$, 10, and 11 inches. The results of these firings indicated that the 8-inch twist gave greater accuracy than the longer twists, but that after a number of rounds had been fired the accuracy with the 8-inch twist decreased much more rapidly than with the longer twists. After firing 3,000 rounds, the accuracy of the 8-inch twist decreased 30.7 per cent, and that of the 9-inch twist, 25.1 per cent. After firing 6,223 rounds with the 8-inch twist, the rifling was practically worn out, while after firing 6,073 rounds with the 9-inch twist its accuracy had decreased only 56 per cent.

As calculations show that a uniform twist of one turn in 10.5 inches is sufficient to insure stable flight of the bullet, a uniform twist of one turn in 10 inches was adopted.

The experience had during the experimental firings conducted for determining the accuracy, drift, etc., of this rifle, indicates that, due to erosion of the bore at the bullet seat by the powder gases and to the

wearing of the lands of the rifling, the accuracy of the barrel begins to diminish after firing from 1,600 to 2,000 rounds. As the energy of recoil may prove sufficiently great to make raw troops flinch in firing, it may be found advisable to make a slight reduction in the muzzle velocity of the rifle, which reduction can be made and still leave this arm more powerful than those in general use in foreign military services.

Tables showing the number of spare parts prescribed for issue to regimental and post-ordnance officers for repairing the new rifle in the hands of troops, and to ordnance depots established in time of war, and the number of spare parts to be made with each 1,000 completed arms for storage until required in time of war, have been adopted. The spare parts for the latter purpose will be packed in special boxes for storage.

A special form of chest has been made for issue to post-ordnance officers of posts at which not less than two battalions of infantry or two squadrons of cavalry are stationed to insure the safe-keeping and better care of spare parts.

United States magazine rifle, model of 1898.—The output of United States magazine rifles, model of 1898, was gradually decreased as that of the new rifle was increased, until its manufacture ceased entirely in November, 1903. As the United States magazine rifles and carbines of the models of 1896, 1898, and 1899 were provided with five different models of rear sights, viz, models of 1892, 1896, 1898, 1901, and 1902, a sufficient number of model of 1902 sights are being manufactured to replace the models of 1892 and 1896, and all model of 1898 sights are being altered to the model of 1902, thus reducing the number of different models from five to two. The addition of the plate containing the peep-sighting notch constitutes the principal difference between the models of 1898 and 1902. As these arms are replaced with the new rifle, they will be thoroughly overhauled, cleaned, and stored as a part of the reserve supply.

The District of Columbia and all the States and Territories, except Nevada and New Hampshire, have been supplied, practically to full authorized strength of their Militia, with this old magazine arm of Krag-Jorgensen type.

Revolver.—As experience had in actual service with the present service caliber .38 revolver showed that its bullet does not possess sufficient stopping power and shock effect, experiments were undertaken for the purpose of ascertaining what design and caliber of bullet possesses these essential features. When these experiments are completed advantage will be taken of the change in cartridge, should such a change be necessary, to definitely decide, in view of the experience had with automatic pistols in the hands of troops, whether any design of that class of weapon has reached that stage of perfection to warrant its substitution in service for the revolver.

The subject of the automatic musket is in about the same state as described in my last annual report, although it is anticipated that more than one design will be ready for test during the coming year.

Automatic machine guns.—As the tests made by the Department during the past several years indicated that several different designs of automatic machine guns had been brought to a practical working stage under service conditions, a board of officers, of which Capt.

Edwin V. Bookmiller, Ninth Infantry, was president, was convened by the War Department, August 20, 1903, for testing such automatic machine guns, mounts, and pack outfits, as might be referred to it from this Office. As soon as the design of ball cartridge, model of 1903, was completed, all American and foreign inventors of this class of arms were invited to submit their devices for test. The following were submitted and tested by the board, namely: Colt's automatic machine gun, tripod mount, carriage, and pack outfit; Danish rifle mitrailleuse and tripod; Vickers' Sons & Maxim solid action and standard pattern guns, tripod mount, galloping carriage and sleigh mount, and pack outfit.

The recommendation of the board that, as a result of the thorough and exhaustive tests to which the four guns were subjected, the Vickers' Sons & Maxim standard pattern automatic machine gun, tripod, and pack outfit be adopted for issue to field troops, and the same gun, on a broad-tired wheel mount, be adopted for issue to seacoast forts, was approved by the Secretary of War on November 10, 1903.

The report of the board forms Appendix No. 1 hereto.

Ninety guns, tripod mounts, and pack outfits are now being manufactured, and funds are available for the purchase of 30 additional guns, tripods, and pack outfits for field troops, and for 30 guns and wheel mounts for seacoast forts. As no satisfactory form of wheel mount could be obtained, it is being designed by Capt. W. S. Peirce, Ordnance Department, at the Springfield Armory. It is intended for field service that pack transportation should be provided for 7,000 rounds of ammunition for each gun, which requires the use of 5 mules, loaded as follows: One with the gun, tripod, 3 ammunition boxes, spare lock, feed block, and counter recoil spring; a second with 7 ammunition boxes and the loading machine; and the third, fourth, and fifth each with 6 ammunition boxes and 2 water boxes. The additional spare parts, accessories, tools, etc., to be distributed among the last three.

During the year 40 gatling guns, model of 1903, were procured. These guns were built for the model of 1903 cartridge.

Cavalry sabers.—As the supply of light cavalry sabers on hand at the close of the civil war has been practically exhausted, an order for the manufacture of 20,000 has been given. The bands on the scabbard will be located nearer the mouthpiece, so as to bring the lower band above the center of gravity of the scabbard and sword. As the black nickeling prescribed for scabbards by General Orders, No. 81, of 1902 frequently peeled off in service, all scabbards will hereafter be browned.

Miscellaneous.—Five thousand machetes and scabbards were purchased during the year for the use of troops serving in those parts of the Philippines where the dense undergrowth renders them necessary. Three thousand knives and scabbards of special design for issue to the Hospital Corps are being made. As scabbards for officers' sabers made of german silver under General Orders, No. 81, of 1902, proved too soft for service conditions, they are now being made of steel and then heavily nickel-plated. The guard will, for the same reason be made of bronze, heavily nickel plated. The black nickel scabbard for officers has been abolished.

SMALL-ARMS AMMUNITION.

The ball cartridge, model of 1903, has been perfected and manufactured in quantity during the year.

Guard cartridge.—The multi-ball cartridge, caliber .30, has been replaced by a "Guard" cartridge having a single lead ball, weighing 156 grains. A sufficient powder charge is used in this cartridge to give the bullet a muzzle velocity of 1,150 feet per second.

Gallery practice cartridge, caliber .30.—An elongated lead bullet, weighing 107 grains, provided with two cannellures for holding lubricant, has been substituted for the round ball. With this form of bullet much greater accuracy is obtained.

Additional safeguards have been adopted to prevent the accidental packing of ball with blank cartridges. Hereafter each pasteboard box of 20 blank cartridges, when sealed, will be weighed, the difference in weight between a service and a paper bullet being sufficient to enable the presence of one of the former bullets to be detected. In addition, the length of the blank cartridge, model of 1903, has been reduced one-tenth inch, and the machine for inserting cartridges in the clips adjusted so as to prevent the insertion of a ball cartridge in a clip loaded with blanks.

Experiments have been made with a view of obtaining a suitable bullet for small arms and machine guns that will penetrate the hardened protective shields with which modern field artillery are provided. No success in this line has yet been attained.

Bandoleer.—The experiments referred to in my last report, made to develop a cheap cloth bandoleer having six pockets, each containing 10 cartridges, have been completed, and hereafter all caliber .30 ball cartridges, models of 1898 and 1903, will be packed and issued in bandoleers instead of pasteboard boxes.

The wooden packing boxes for ball cartridges have been sufficiently enlarged to hold 20 bandoleers, or 1,200 cartridges. The boxes containing model of 1898 cartridges weigh 92 pounds, and the model of 1903, 99 pounds. This new box can be packed on an aparejo with facility and it enables one mule to carry 40 per cent more cartridges without undue burden.

A distinctive colored label on the pasteboard boxes has been adopted for each kind of cartridge.

SMALL-ARMS TARGET PRACTICE.

The Firing Regulations for small arms, dated January 1, 1904, prescribed a number of new targets which were made and issued in time for this year's target practice. As the adoption of a primer composition containing no fulminate of mercury, and of improved methods of manufacturing cartridge cases has overcome the splitting of the latter when fired a few times, the practicability of re-establishing the system of reloading ammunition by troops is under investigation in order that the expense incident to the increased allowance per man for target practice may be reduced as much as possible. The privilege of exchanging empty cases for new ammunition has been extended to the militia of the several States and Territories. A number of targets have been made in accordance with a design submitted by Maj. C. H. Murray, Fourth Cavalry, and issued for trial. The reports so far received indicate that it is superior to existing designs.

EQUIPMENTS.

The adoption of the new rifle for all arms of the service rendered necessary a new design of gun sling and of scabbard, both of which are being manufactured. The gun sling was shortened so as to provide only two thicknesses of leather except near the butt swivel. The manufacture of the new cartridge belt described in my last report has been continued during the year and the limited experience so far had with it has been satisfactory. A new woven strap has been adopted for attaching the canteen to the belt, which will replace the leather canteen strap heretofore issued to the cavalry. Pouches for the first-aid packet are being made in quantity in accordance with the design of Lt. Col. John Van R. Hoff, Medical Department.

Russet leather.—Equipments made of the stuffed russet leather prescribed by General Orders, No. 81, 1902, soiled the soldiers' clothing to such an extent that it was found necessary to adopt a leather containing even less oil than that referred to in my last report. The greater part of the leather equipments so far made during the present calendar year have been made of this new leather. It is believed that the khaki and olive-drab uniforms prescribed by the same order show grease stains much more plainly than the blue. A process was devised at Rock Island Arsenal by which nearly all the oil in the first leather can be removed, and orders have been given to apply it to a sufficient number of the different leather equipments, which with those made of the new leather, will enable all of the older in the service to be replaced. The equipments thus replaced will be cleaned and stored as part of the reserve supply since the oily leather keeps much better in storage. The manufacture for sales to officers of sword belts and dispatch cases of pigskin has been approved by the Chief of Staff.

With a view to improving the equipment, General Orders 81, 1902, directed the manufacture of certain articles for trial. One thousand each of cups and meat cans were made of aluminum and issued to troops in the Philippine Islands. The reports were in general favorable in regard to the meat cans, but much complaint was made of the retention of heat by the cups and particularly by their handles, due to the high conductivity of aluminum. Tests were therefore made at Rock Island Arsenal to ascertain the extent to which this defect could be mitigated. As the use of a tinned steel handle with fiber washers between the handle and aluminum body was found to remedy this defect, 5,000 cups are being made for further trial. This latter cup weighs $4\frac{3}{4}$ ounces and the present design $7\frac{1}{4}$ ounces. The new meat can weighs $9\frac{1}{4}$ ounces and the present design $15\frac{1}{4}$ ounces. As no commercial method is known by which aluminum can be soldered, canteens of the present shape could not be made for trial.

One thousand each of experimental watering bridles, combination halter bridles, Pelham bits, and picket pins of two different designs have also been manufactured and issued to the service for trial. As soon as reports have been received from all the organizations by which they were tested they will be submitted to the Chief of Staff for his action.

SERVICE GUNS AND MORTARS.

These have been maintained in a satisfactory state of efficiency. The new firing mechanisms referred to in my last annual report are

now being assembled, and this work will continue in the different armament districts as rapidly as possible. Efforts to improve the rapidity of fire of seacoast and other guns have not been relaxed. The direction of such efforts during the year has principally been confined to mechanical rammers, automatic breech openers, and desirable changes in details of existing mechanism.

An experimental mechanical rammer was designed and tested with a 12-inch B. L. rifle on a 12-inch disappearing carriage, L. F., model of 1901. The object of this device is to decrease the time and labor required to seat the projectile and powder charge in the chamber of the gun. It consists of a car, traveling on a circular track on the loading platform of the emplacement, and carrying separate loading trays and rammers for the projectile and powder charge. The force required for seating the projectile in the bore is obtained from springs compressed by hand power between shots. The powder is seated by a rammer actuated by hand power only. The results of the tests of the device showed (a) the projectile was discharged into the gun at such high velocity that hardened-steel projectiles would injure the rifling and parts of the bore about the entrance to the projectile seat; (b) with the present form of powder grain and quantity required for full charge, that all sections of the charge can not be inserted simultaneously. The device will be altered so as to insert and seat the projectile at a lower velocity, and subjected to further tests. The difficulty of inserting the powder charge in one operation would, it is believed, be overcome by the substitution of rods for the present grains of powder.

An experimental mechanical breech opening and closing device has also been designed and made. It is now being tested on a 12-inch B. L. rifle mounted on a disappearing carriage.

EXPERIMENTAL GUNS.

10-inch Brown segmental-tube wire gun.—This gun was constructed and is being tested under allotments made by the Board of Ordnance and Fortification. It was completed some time since and the test under a programme of firing 100 rounds commenced. Since November, 1903, when 15 rounds had been fired, the test has been discontinued, owing to the disabling of the locking device of the breech mechanism in firings about that date. Some changes in this device will be required, and this office is informed that steps are to be taken by the company with a view to the removal of the gun to the Scott Foundry, Reading, Pa., for this purpose.

6-inch Brown segmental-tube wire gun.—The cost of the manufacture and test of this gun will be defrayed from allotments made by the Board of Ordnance and Fortification. This gun and mount was delivered at the Sandy Hook proving ground for test October, 4, 1904.

6-inch wire-wound gun, Ordnance Department design.—This gun is now under construction at Watervliet Arsenal, the cost of its manufacture and test being defrayed by allotments from the Board of Ordnance and Fortification. The manufacture is proceeding satisfactorily, and it is expected to be delivered at the proving ground for test about November 15, 1904.

Semiautomatic 15-pounder R. F. gun and mount.—This gun will be manufactured and tested under allotments from the Board of Ordnance

and Fortification. The gun is of higher power than guns of the same caliber which have been heretofore manufactured, and the semiautomatic breech and firing mechanism follow designs submitted by the United States Ordnance Company. This gun and mount should be completed and ready for test during the fiscal year 1905.

Semiautomatic 6-pounder guns.—Allotments were made by the Board of Ordnance and Fortification during the present fiscal year for the purchase of several types of these guns with power to give to the projectile a muzzle velocity of 3,000 feet per second. Proposals have been invited and contracts made for the construction of four guns and mounts complete, the chambers of the guns being designed to permit the use of ammunition prescribed by this Department. These guns should be completed and delivered at the Sandy Hook proving ground in the early part of 1905, and their test will be undertaken immediately thereafter.

MOUNTAIN ARTILLERY.

The completion of the remaining carriages which are being made at the Watertown Arsenal for the 75-millimeter mountain guns and of the pack saddles under manufacture at the Rock Island Arsenal will provide 120 mountain guns, carriages, and sets of pack outfits. Although these carriages are of recent design, the practicability will be investigated of altering them so as to increase the length of recoil of the gun on the carriage, to make the latter more stable during firing, thereby increasing its rate of fire. A sufficient number of pack saddles are being made to provide each gun with 13 saddles, enabling 100 rounds of ammunition to be carried per gun. Each battery will be provided with two additional saddles for saddlers' and farriers' tools.

MOUNTAIN GUNS AS FIELD MORTARS.

Experience in the Philippine Islands indicates the desirability of firing mountain guns at higher angles of elevation than originally contemplated by existing designs. In order that proper plans may be made for the use of these guns in this manner, experiments are now in progress to determine the number of powder charges required, with proper overlap of zones of fire, to cover the field within the range of the guns under conditions considered to be necessary for the proper realization of the effect desired. In view of the lack of adaptability of fixed ammunition to the possible requirements of such service, consideration will be given to the subject of separate loading for this purpose, in connection with arrangements required for packing it. It is recognized that to realize efficient service from such material a number of changes are required, and the tests in progress have for their purpose the determination of these changes in connection with the acquirement of additional knowledge in regard to the effectiveness of these guns in high-angle firing.

FIELD ARTILLERY.

The manufacture of the 3-inch field artillery matériel has progressed satisfactorily during the year. The difficulty referred to in my last report of obtaining the superior quality of materials required in its

construction has been overcome with the exception of the counter-recoil springs and panorama sights. All of the matériel except these two articles is being procured in this country. Repeated efforts have been made to interest American manufacturers in the making of the two excepted articles and, it is believed, with success. Appropriations have so far been made for 26 complete 3-inch field batteries for the Regular Army and 26 batteries for the Militia, all of which are now under manufacture, except 6 guns, carriages, and limbers, which have been completed and issued. The remainder should be finished by October 1, 1906. The pilot 3-inch carriage was completed and proof-fired at Rock Island Arsenal last December, and was then sent to the Sandy Hook proving ground for further test. There have been fired from it 787 rounds. As the margin of stability of the carriage for horizontal fire was found to be greater than necessary, the length of recoil of the gun on the carriage was reduced from 48 to 45 inches. The action of the carriage with the 45 inches of recoil was highly satisfactory.

The design of the sights for this carriage was completed after much study, and sights are now being made at Frankford Arsenal for all carriages under manufacture. The sighting apparatus differs materially in design and operation from that previously used in our service; the principal difference consists in the provisions made for indirect laying of the gun and for setting it in elevation from either side of the piece. This latter provision enables the piece to be kept constantly on the target, and results in an increased rate of fire. On the left side of the carriage there are an open front sight, with cross wires, and a rear sight, the shank of which carries a peep and a panorama sight. The latter sight has a 1-inch objective, a field of view of about 10° , a magnifying power of 4 diameters, and forms the image erect. The axis of the objective is 5.6 inches above that of the eyepiece, and by means of worm gearing can be rotated through any angle about the vertical axis of the telescope. A glass reticule is provided with horizontal and vertical cross lines, and two additional horizontal lines, 3 and 6 millimètres, respectively, above the horizontal line. The rotating part carries a disc graduated to 64 points, each point being 100 millimètres. The rotation of the eyepiece is effected by means of a worm provided with a micrometer giving a least reading of 1 millimètre or one one-thousandth of the range. The shank can be swung laterally to correct for differences in level of the wheels; it has an elevation scale graduated in yards, and a deflection scale graduated in points.

The range quadrant on the right side of the piece has adjustments for correcting for differences in level of the wheels and for the angle of site. It is graduated in yards. A battery commander's telescope is now undergoing trial; its telescope is similar to that of the panorama sight and has vertical and horizontal scales graduated to the same unit as the panorama sight.

The different breech mechanisms for field guns referred to in my last annual report have been tested for the purpose of ascertaining their relative merits and to develop desirable features for adoption in future manufacture. The report of the Ordnance Board on this subject is contained in Appendix 6 of this report. The results of these tests indicated that the mechanism of the present 3-inch guns, model of 1902, is of a safe type and fitted to render efficient service. The opinion was expressed, however, that it could with advantage be

replaced by a simpler type involving less care in maintenance and less expense in manufacture. Of the designs tested, the Tasker, submitted by the United States Ordnance Company, was found to possess marked advantages over the others, and arrangements are now being made with a view to the utilization of this design in field guns to be manufactured this year.

The preparation of general designs of a 3.8-inch field gun and carriage and of a 2.38-inch field gun and carriage was assigned to the student officers of the Sandy Hook proving ground as part of their instruction, and was creditably completed by them. This design of the 3.8-inch field carriage was sent to Rock Island Arsenal, where detailed working drawings were prepared by Capt. George W. Burr, Ordnance Department, which are now undergoing final examination. The 2.38-inch gun and carriage will also be used around seacoast forts, as recommended by the Board of Ordnance and Fortification, December 3, 1903.

Upon its completion the automobile forge and battery wagon referred to in my last annual report was successfully run from Jersey City, its place of manufacture, to this city under adverse conditions of roads, and was further tested on the various roads in this vicinity. During the summer it was issued to the battalion of field artillery at Fort Myer, Va., for further test during practice marches and the Manassas maneuvers. The wagon when fully equipped for the field weighed about 12,000 pounds, which was too great for the bridges and culverts found on the average country road. Much valuable information and data were obtained from the building and operation of this wagon, which are being utilized in a new design under preparation in this office. The new wagon will carry complete machinist's, carpenter's, saddler's, and farrier's tools, and a limited quantity of supplies, but no spare parts, etc., for the battery. This will enable the weight of the loaded vehicle to be reduced to less than 8,000 pounds. The motive power will be supplied by four cycle gasoline engines, as in the earlier model.

As rapidly as the present 3.2-inch is replaced in service by the 3-inch field matériel, it is proposed to thoroughly overhaul and repair the former, preparatory to its storage as part of the reserve supply, until a sufficient supply of the later design is obtained.

EXPERIMENTAL FIELD MATÉRIEL.

Although a satisfactory system of field artillery has been adopted, the policy of the Department to continue tests of promising designs has been continued.

Small-caliber field gun.—Claims having been made that a field gun of about 2 inches in caliber, mounted upon a long recoil carriage and firing high explosive shell weighing about 5 pounds, would in a given interval be more effective than a 3-inch field gun firing shrapnel, tests were made during the year for the purpose of securing information and arriving at an opinion in regard to the relative value and serviceability of such material. These tests have not sustained the claims above mentioned. On the contrary, the rapidity of aimed fire from these two guns not being very different, the relative value of their fire is to be regarded as more nearly proportioned to the weights of their respective projectiles, especially when it is considered that the 3-inch

gun will fire both a 15-pound high explosive shell and 15-pound shrapnel. The usefulness of the small-caliber explosive shell is apparently restricted to destructive effect by direct projectile hits upon exposed material, such as field guns, caissons, houses, etc., since its explosive charge is not sufficiently powerful to be of much value in breaching effect.

The pattern of such small caliber shell exploded in flight is similar to that of the 15-pound shrapnel—i. e., the fragments are projected forward in a similar cone of dispersion. The shell was, however, of slight value in its effects against troops in the open, since the action of its percussion fuse was such that the burst occurred frequently on impact with the ground or after ricochet on a rise of a few feet only. Its value in this respect would probably have been improved by having a longer delay action in the fuse. The form of the cone of dispersion due to the small bursting charge was such that the shell could not be used for searching effect on troops in ditches or behind parapet. Capacity to accomplish this purpose is generally regarded as the chief reason for employing high explosive shell with field guns. It may be remarked that the plans of this Department contemplate the use for field purposes of a lighter gun than the 3-inch gun now under manufacture, and it is proposed to make the caliber of this gun 2.38 inches, the projectile for which will weigh $7\frac{1}{2}$ pounds, this being considered the smallest caliber which can employ an efficient shrapnel.

The latest designs of 3-inch field guns and carriages of the Bethlehem and Ehrhardt types were also tested during the year.

SIEGE ARTILLERY.

A 4.7-inch siege gun and long recoil carriage has been designed and the carriage partly completed during the year. When finished, they will be thoroughly tested prior to their manufacture in quantity. The gun fires a 60-pound projectile with a muzzle velocity of 1,700 feet per second, and has a recoil of 66 inches on the carriage. A 6-inch siege howitzer and carriage is being designed in this office, and when completed a pilot carriage and howitzer will be built for test. In order that full advantage may be had of the experience gained at arsenals in the manufacture of carriages, and to give different officers the professional benefit derived from designing ordnance material, the designing of a 6-inch howitzer carriage was assigned to and completed by Capt. Lawson M. Fuller, Ordnance Department, while on duty at Rock Island Arsenal, and that of a 4.7-inch howitzer carriage to Capt. Colden L'H. Ruggles, Ordnance Department, on duty at Watertown Arsenal. The first design has been completed and is a creditable production; the second is not completed.

A board of artillery officers having recommended that the wheels of siege carriages and limbers be provided with tires 5 instead of 4 inches in width, tests were made at Rock Island Arsenal with a 7-inch siege howitzer carriage and limber with wheels having tires 3, 4, 5, and 6 inches in width on seven different kinds of roads. A description of the roads, material, and method of making the tests, and the results obtained forms Appendix 3. The results of the tests show that although the wider tires are less destructive to roads, the 4-inch tire requires less tractive force and is better suited for siege artillery than 5 and 6 inch tires.

SEACOAST CARRIAGES.

The manufacture of seacoast carriages during the year has progressed to the extent permitted by appropriations for the purpose. In addition to the carriages being manufactured at arsenals, contracts exist with the following private manufacturers, namely: 15-pounder guns and carriages and 4½-inch shields, with the Bethlehem Steel Company; 6-inch barbette carriages, model of 1900, with the Builders Iron Foundry; 5-inch barbette carriages, model of 1903, and 6-inch disappearing carriages, L. F., model of 1903, with the Morgan Engineering Company; 6-inch disappearing carriages, L. F., model of 1903, with the Mansfield Engineering Company, the Detrick and Harvey Machine Company, and the Wellman-Seaver-Morgan Company.

The progress made in the manufacture of the 15-pounder guns and mounts has not been satisfactory. A satisfactory design of telescopic sight has only recently been submitted and approved.

After much delay a contract was finally entered into for the 4½-inch shields required for the 6-inch barbette carriages under manufacture. In view of the experience had in the manufacture of this lot, no difficulty is anticipated in procuring shields for the 5-inch barbette carriages.

The 6-inch disappearing carriage, L. F., model of 1903, is essentially a rapid-fire mount. The time required for the gun to rise into battery has been reduced to about three seconds. In the shop tests of several carriages this operation required only two and three-fifths seconds. A sighting platform and 3-inch objective telescopic sight are provided on each side of the carriage. On the left platform are handwheels for traversing and for elevating, and on the right a handwheel for traversing only. This enables each of these operations to be performed by a separate gunner when direct fire is used. Springs, which the upper ends of the gun levers compress during the last part of their rotation in recoil, accelerate the beginning of the return of the gun into battery.

10-INCH EMERY DISAPPEARING CARRIAGE.

In accordance with the provisions of the fortifications act approved April 21, 1904, it was directed on June 9, 1904, that the contracts made with A. H. Emery for one 12-inch depression carriage and loading apparatus be closed, and that a new contract be entered into with him for one 10-inch disappearing carriage to be furnished in place of the 12-inch, together with its foundations, erection, and preliminary tests by him, ready for proof tests for the price of \$84,383.02. The contract was made on June 13, 1904, and its construction was immediately begun by Mr. Emery.

TELESCOPIC SIGHTS.

Orders have been given during the year for 271 of the 3-inch objective telescopic sights described in my last report. Several minor changes in their design have been made. The design of a similar telescopic sight has been undertaken for application to all rapid-fire mounts in service.

NEW DESIGNS AND PROPOSED ALTERATIONS IN SEACOAST CARRIAGES.

As much time is consumed in applying a quadrant to a mortar each time it is laid in elevation, several different designs of fixed quadrants and elevating devices have been made and tested. The design submitted by Capt. E. P. O'Hern, Ordnance Department, was found to be most satisfactory, and a number are being made for practical test during next year's army and navy maneuvers. The design of the safety firing switch for mortar carriages has been completed and the switches ordered applied to all carriages in service. This switch positively breaks the firing circuit until the mortar is elevated to 45° , the lowest elevation at which mortar fire is had.

All of the 12-inch disappearing carriages, L. F., model of 1897, will be provided during the coming year with complete electric traversing, retracting, elevating, and depressing equipments; 3-inch objective telescopic sights, sighting platforms, counterbalance devices, etc., which will make them in all material respects the same as the 12-inch disappearing carriages, L. F., model of 1901. All 12-inch disappearing carriages, L. F., model of 1896, in service are being equipped with electric retracting equipment. The retracting gears of the 8-inch and 10-inch disappearing carriages, L. F., model of 1894, are being redesigned and will be provided with wire retraction ropes. The only means provided on the 15-pounder barbette carriages, procured from the Driggs-Seabury Company, for moving the gun in azimuth, was the shoulder bar, which experience shows is not satisfactory. A system of gearing for this purpose has been designed and will be applied to all carriages in service when funds permit. A multiple scale for range drums and pointer has been designed and a number will be issued for trial. The design allows the effect upon the range of all variations in the muzzle velocity from the standard to be corrected for by data obtained from a trial shot.

The investigations for verifying the accuracy of the formulæ heretofore used in the calculation of the throttling openings of the hydraulic recoil system of gun carriages, referred to in my last report, have been continued. A formula has been experimentally determined which, with those formerly used, allows for the contraction of the liquid vein, and has been practically tried in different carriages with excellent results. It is found that the flow of oil through the orifice varies materially with the form of piston used. The results of the investigations so far made form Appendix 4. These investigations will be continued.

MAINTENANCE AND CARE OF THE ARMAMENT OF FORTIFICATIONS.

The system of dividing the seacoast and field armament for maintenance and improvement into districts continues to operate most satisfactorily and to save much time and unnecessary correspondence. It will be extended to include all the principal material furnished by this Department, such as range-finding instruments, powder, projectiles, etc.

The results obtained from the installation of the small machine shops at the principal seacoast fortifications have demonstrated the economy of that method of making repairs and minor alterations.

DEFENSE OF INSULAR POSSESSIONS.

Appropriations made by Congress at its last session provide for the commencement of the fortifications of the insular possessions. The needs of the Ordnance Department on account of this work are pointed out under the heading of Manila Ordnance Depot.

RANGE-FINDING INSTRUMENTS.

Contracts have been made during the year for 159 Swasey depression position finders, type A, of which 40 have been completed. One hundred and fifteen Pratt's ballistic boards and 200 Whistler's plotting boards are being manufactured at Frankford Arsenal. At the suggestion of Major Whistler and Captain Hearn, Artillery Corps, a gun arm has been added and the azimuth circle changed, which makes the Whistler plotting board universal in its application and reduces the number required by one-half. A number of minor changes recommended by the artillery board have also been embodied in these boards. Standard designs of predicting scales, set-forward computers, and deflection correction devices have not yet been adopted.

EXPERIMENTS TO DETERMINE THE DANGER OF IGNITION OF FIXED AMMUNITION FOR FIELD GUNS.

These experiments were made with .30-caliber bullets and 1-pounder projectiles, the former being fired to strike cartridge cases of fixed ammunition for field guns with varying velocities corresponding to remaining velocities in flight. The charges in the fixed ammunition were in no case detonated. To ignite the charges, a velocity of 2,000 foot-seconds in the .30-caliber projectiles was required. The 1-pounder projectiles were fired with a charge to give velocities of 2,000 foot-seconds, and while the powder in the cartridge cases was not in all cases ignited by the impact, this occurred often enough to show that it will be the probable result. After firing at single cartridges suspended in the air the 1-pounder projectiles were fired at a box containing ten cartridges. In one case only one charge was ignited, and it burned without setting fire either to the box or to the remaining cartridges, and in another case three cartridges were ignited and the resulting fire set fire to the box. During the burning of the box one other charge exploded; the remaining six were recovered without apparent injury. It is inferred from these results that there will be no danger of detonations from field cartridges by the impact of field artillery or small-arms projectiles.

STREAKED FORGINGS.

The tests of streaked metal in gun forgings have been continued during the year. Streaks are, as a rule, of little depth, and attempts to locate tangential test specimens in such a way that streaks could be subjected to test by tensile forces normal to their surfaces have been more or less unsatisfactory. By taking smooth cuts on the faces of rings, streaks are revealed in cross section as lines of varying length up to one-half inch or more, and, being of circumferential direction, radial specimens traverse the streaks in a favorable manner for test.

The streaks thus appearing on the planed faces of the rings were numerous, not infrequently reaching five per square inch; but attempts to photograph them were unsuccessful. One piece of metal was planed to a thickness of 0.2 of an inch; a prominent streak was revealed and three radial specimens were taken across it. Several specimens fractured along the line of this streak, with a reduced elastic limit and tensile strength and very little elongation and contraction of area. It is true that the contraction and elongation of specimens taken at right angles to the direction in which the metal is principally drawn by forging are not expected to be so great as these characteristics in specimens taken with axes parallel to that direction; but the elongation and contraction of metal sound in the ingot should not be so reduced or effected in any direction by forging as to vary in metal forged in the same way by the same manufacturers from practically nothing to almost as much as shown by the best specimens taken with axes parallel to the direction in which the metal was drawn, nor should sound metal be so effected by proper forging as to lower its ductility in any direction far below that which should be displayed by ordinary steel castings. From a number of tests made upon metal received from abroad the results of the tests of the radial specimens were nearly equal to those of the tangential specimens. These records, while not numerous, serve to indicate that a defective radial specimen is not necessarily a natural consequence of forging steel.

It can not be assumed that all streaks will be disposed with their surfaces concentric with the cross section of the forging, i. e., parallel to the principal stresses which will act on a hoop or tube when assembled in a gun. It is quite probable that some of the numerous streaks will be so deflected that their surfaces will take an inclination spirally toward the axis, bringing them across the direction of the principal stresses and thereby menacing the strength of the forging.

The tensile tests now prescribed by the specifications show the physical qualities of the metal resulting from its carbon content and heat treatment, but only by chance do they reveal the presence of a defect. Tests having for their special object a revelation of defects impairing the strength and ductility of forgings as a whole below what has been shown by the tensile test specimens are therefore necessary. It is possible that a mandrel test may be the means for determining the presence of such defects, and this test is under consideration. It is considered to be less expensive and more comprehensive than a requirement that as many small tensile specimens be tested as may be taken from the end of a forging.

SMOKELESS POWDER.

This Department has continued its investigation of smokeless powders with a view to improving their qualities to enable them to be fired under pressures of from 40,000 to 45,000 pounds per square inch for the purpose of utilizing the strength of our service guns. It has been noted that some powders when fired at high pressures develop critical points in their pressure curves, or points at which the rate of evolution of gases suddenly increases for an increase of charge, resulting in excessive pressures, often exceeding the elastic strength of the guns. Early examination of some such powders indicated them to be normal, except that the material of the grains appeared to be more brittle than

those of other lots. When struck by hammer on an anvil or when compressed longitudinally in a vise pieces would break away from the grain with more or less violence, while grains from other lots of powder without critical points would be compressed to flat disks without breaking into separate and detached pieces. This quality of brittleness is considered to be a source of danger, and the experiments in regard to it have resulted in the introduction into the specifications for smokeless powders of a test to determine the toughness of the colloid. This test is as follows: Take 10 powder grains representing a lot of powder to be examined and cut off both ends of each grain at right angles to the length of the grain until the length equals the diameter=1. Compress these slowly between parallel surfaces until the first crack appears. The decrease in length necessary to crack the grain is calculated as a percentage of the original length, and the average must not show less than 45 per cent. A very good powder should show over 50 per cent.

When attention was first invited to the effect of brittleness it was suggested as being important that the relation between brittleness and percentage of volatiles be determined and three samples of powders having percentages of volatiles of 4.33, 3.73, and 3.33, respectively, were selected for test. When fired no critical points were obtained in any of the pressure curves. One of the samples was placed in the heating chamber and the temperature regulated at 120°, which was subsequently raised to 150° and then to 180° F. The heating was continued at intervals for about six months. The test indicated that under continued drying at high temperatures a maximum of quickness is reached after which, for some reason, the powder becomes either slower or weaker. An important deduction is that as long as powders retain their normal percentages of volatiles from which they are with difficulty deprived, they should not give dangerous pressures in firings with service charges, and the toughness of the powders was found not to be materially affected by considerable variations in the normal percentages of solvents. The Department has now under consideration a possible change in the form of the grain to increase the progressiveness of the powder, and the necessary investigations may even lead to a change in the composition.

The reserve supply of powder issued to posts is stored in hermetically sealed galvanized cases. These cases are effective, can be repeatedly used, and have sufficient strength to permit of their being piled on their sides in tiers as high as the head room of magazines will permit. Some of the early forms of cases were sealed by balata washers which were found to be unsatisfactory. Means have been found by which these can be converted at a very slight expense into those of later model in which the sealing is done by a soldering strip, and the changes are being made as rapidly as possible.

ETHER-AIR MIXTURE.

The presence of the odor of ether in magazines containing smokeless powder has resulted in inquiries as to the dangerous nature of an ether-air mixture. This odor results from the escape of ether from storage cases which are not perfectly sealed, owing to the deterioration of the balata washers which were formerly used for this purpose. It has been found that a mixture of ether vapor and air becomes explosive

when the proportion is 1.7 cubic feet of ether vapor to 100 cubic feet of air, leading to the conclusion that ether vapor is never present in our powder magazines in sufficient quantity to form an explosive mixture with air. When the changes in the cases having balata washers have been completed, the odor which has heretofore been present will probably disappear.

FUZES.

Experiments during the year have been principally with centrifugal fuzes. Several tests have been made of experimental lots of Frankford Arsenal combination fuzes. The difficulty in igniting the time train which was encountered in the first model has been entirely removed. There is, however, a tendency to burn with occasional irregularity when set above ten seconds. Difficulties in controlling and regulating the burning of the powder time train for combination fuzes have led inventors to attempt to devise a mechanically operated time fuze, but the results so far, although interesting, have not been successful. Two fuzes of this class have been tested during the year, the test of one being still in progress. This class of fuze is intended to be operated by the rotation of the projectile during flight.

ARTILLERY TARGET PRACTICE.

Recent orders prescribing the annual allowance of ammunition for artillery practice require a reduced amount for guns of larger caliber and an increased amount for subcaliber tubes, for the purpose of giving larger experience in fire-command practice. The present scheme of practice with subcaliber tubes contemplates the manning of two guns in every battery and four mortars in every mortar battery at any one post in an artillery district at the same time. Since it is planned to transfer tubes and fixtures from one post to another in the same artillery district it is expected that this method will result in a reduction in the originally estimated cost of providing them. The service of subcaliber tubes with guns on disappearing carriages requires the use of platforms on which cannoneers can stand to load the piece. Such platforms have been designed and are now undergoing test. The design contemplates the permanent attachment of certain parts to the gun and carriage, to which the platform can be hooked. A few additional fixtures will be required, and arrangements for their purchase are now being made. Steps have been taken to make cast-iron projectiles for target practice similar in form and weight to the steel armor-piercing projectiles, and a sufficient number of the former will be on hand to permit their use after July 1, 1905.

Point-fused, large-capacity shell for 1-pounder subcaliber tubes have been tested satisfactorily, and a large number are now under manufacture.

Similar shell for 75-millimeter tubes have failed to meet the expectations of this Department, owing to the failure of the shell to burst sufficiently near the surface of the water at high angles of elevation to permit the smoke of the bursting charge to be observed. When these shell have been fired for impact through board screens or on the beach or on water, within the ricochet angle, the results have been satisfactory. When the angle of fall has been beyond the ricochet angle,

however, all fuses have failed to work, or they have exploded too far below the surface of the water to be of any use in promoting visibility. For the present, therefore, the 75-millimeter subcaliber shell will be issued sand loaded, without fuse. Experience indicates that the point of striking the water under these conditions can be observed at usual ranges if the approximate point of striking is known in advance. In the meantime attempts will be made to use a base fuse in these shell with less delay action, to make the shell burst before they are too deeply submerged.

ARTILLERY TARGETS.

Improvements have been made during the year in the heavy-gun and rapid-fire targets for artillery practice. The latter is intended to be hit and is sometimes called "material target." The former marks off a distance of 150 feet, the length of the superstructure of a 360-foot battle ship, and is constructed to assist in locating shots and not to be hit. The trials indicate that the heavy-gun targets can be towed in tandem 150 feet apart at any practicable speed and in any sea that will not carry away the canvas, and that the flag line joining the mastheads can be kept sufficiently taut without causing the rear target to show a tendency to dive. If anchored, either target will support at least 300 feet of anchor rope. The rapid-fire target consists of a flat area of cloth 20 feet long and 5 feet high, about 2 feet in the clear above the water. The cloth is painted red and the frame work can be quickly repaired when any portion of it is shot away. Trials have indicated that this target has a satisfactory buoyancy when towed at all practicable speeds, even in rough water. If the necessary precautions are taken in moving the targets to and from the water, in adjusting the ropes for successful towing, and in preserving the targets during storage on land, it is thought that they will prove economical forms for service.

DUMMY PROJECTILES.

A change in the form of the dummy projectiles has been found necessary to protect the rifling of the guns near the powder chamber. The cast-iron body of the original projectiles not only struck the rifling at the bourrelet, but also on the cylindrical part of the body. The new pattern is provided with a bronze band at the bourrelet and has a reduced diameter of body to prevent contact with the rifling at the slope.

SMALL C.

The determination of data for range tables for service guns has involved a large amount of firing at numerous ranges, owing to the fact that the coefficient c is found not to be constant. This coefficient was introduced into ballistic equations for the purpose of making them apply to projectiles of varying form. For a standard projectile this coefficient has been taken as unity, and for a projectile offering greater or less resistance in flight it would be greater or less than unity. Firings so far have not succeeded in establishing the law of variation of the value of this coefficient. In some cases it has its least value at the shortest ranges, increasing to the maximum range. In other cases the value decreases as the range increases, while occasionally a maximum has been reached a little beyond mid range.

These variations of value require a sufficient number of targets to establish a curve of values of this coefficient as a function of the range, it being desirable to incorporate the varying values of this coefficient in range tables, instead of using a constant value as has been the practice heretofore.

RANGE FIRING WITH MORTARS.

The present scheme of range firing from seacoast mortars contemplates the sweeping of the field of fire from a range of 3,000 yards to the maximum range of the mortars. The field between these limits is divided into ten zones, requiring ten different powder charges. At present the maximum range obtainable is 10,800 yards, due to the inability to fire the mortars with sufficiently large charges to give the requisite muzzle velocity for longer ranges, owing to weaknesses which have developed in certain parts of the mount. To remedy this and also increase the angle of elevation to 70° , parts of the mount have been redesigned. The principal changes consist in placing on each side of the mortar opening in the racer a girder on which the recoil cylinders are trunnioned and in replacing the five throttling holes with continuous throttling grooves cut in the walls of the recoil cylinders. When these alterations have been made it will be possible to sweep the field of fire from ranges of about 2,000 to 11,400 yards, and the number of zones required can be reduced to six, or possibly to five. This is particularly advantageous on account of the reduction in the large number of powder charges required by the existing scheme. Under the proposed plan 1,000-pound projectiles will be used with five different charges of powder from the shortest to a maximum range, the angles of elevation varying between 45° and 70° , except that with full charges the highest angle of elevation will be limited to 65° . On account of this limitation it may be found possible to omit the girders, which it has been proposed to add to the carriages. Eight-hundred-pound projectiles will be used for the outer zone only, to extend the ranges requiring full charges and velocities of 1,325 foot-seconds, with elevations between 45° and 65° .

Attention is invited to the report of the Ordnance Board in regard to this firing, which is made Appendix 5 of this report. Recent firings with these mortars indicate very clearly that the drift of mortar shell is to the left for angles of elevation between 60° and 70° . The point of crossing from left to right of the plane of fire seems to vary somewhat with different projectiles, but all of the curves cross before the elevation drops much below 60° . The drift to the right seems to be a maximum for an elevation of about 55° and to then decrease, showing a marked tendency to recross the plane of fire for an angle less than 45° . In order to investigate this tendency more fully and at less expense than that which would result from firings from 12-inch mortars, a series of firings was made from the 75-millimeter subcaliber tube in the 12-inch mortar to include all angles of elevation between 5° and 70° . These latter firings indicate that for the atmospheric conditions existing at the time of the test, the 75-millimeter projectiles did not at high angles of elevation show a drift to the left of the plane of fire; a tendency of the projectiles to go to the left was, however, apparent.

DEFLECTION OF 12-INCH TORPEDO SHELL.

In order to determine whether 12-inch torpedo shell on striking water are deflected toward the surface at any angle of fall, a series of experiments have been inaugurated to embrace the action of projectiles on water impact from the .30-caliber bullet to the largest projectile the trajectory of which under water can be recorded. The firings from a .30-caliber rifle were made from a rest, the inclination to the surface of the water being varied; for each inclination a charge was used to give initial velocities to projectiles of 500, 700, 900, and 1,100 foot-seconds. Thin vertical screens of suitable material were placed near each other and under the water, and the holes made by the bullets in passing through enabled the trajectory to be plotted. The results indicate that the small-arms bullet is first deflected downward toward the normal and then shows a decided tendency to move away from it. In several cases the trajectory, due to this movement, passed the prolongation of the axis of the piece. The energy of the bullet is so rapidly dissipated it is difficult to say how much this movement toward the surface of the water might amount to in a projectile weighing 1,000 pounds. It was observed, however, that the tendency of the bullet to rise to the surface of the water increases as the angle between the line of fire and the surface of the water decreases. It is apparent that for some angles less than 15° the bullet will enter and emerge after traveling some distance under the water. For an angle of fall of 15° the .30-caliber bullet, with a striking velocity of 500 foot-seconds, travels horizontally about 100 calibers after penetrating to a depth of about 23 calibers. These figures are not materially changed by increasing the striking velocity to 1,100 foot-seconds.

If the 12-inch armor-piercing shell loaded with high explosive and fired at extreme range at which it would have an angle of fall of approximately 15° should travel 100 calibers and not penetrate more than 23 calibers below the surface of the water, it is evident that the probable damage to a battle ship would be much greater for the shell striking 100 feet short than for the shell striking the ship, assuming of course, that the percussion fuze in the shell is adjusted not to act on water impact, which is practically the case with service fuzes which will be used. It will be borne in mind that any departure of the sea-coast projectiles from the tangency to the trajectory will increase the chances for reaching the hull of a battle ship by striking the water short of the battle ship, since the increased surface of the shell striking the water would give a stronger tendency to upward deflection. It having been correctly assumed that the dimensions of the target for a mortar shell are increased by twice the effective radius of the shell when exploded under water, the principal lesson from these experiments is that with shell fired from high-power guns the dimensions of the horizontal target may be increased 100 calibers by the shell striking short of the target. The results of the experiments with the .30 caliber bullet have in general been confirmed by firings made from the 6-pounder gun, and firings from guns of larger caliber are in progress.

CAPPED AND UNCAPPED PROJECTILES.

Under allotments from the Board of Ordnance and Fortification this Department has been conducting experiments upon deck armor of

3½ inches and 4½ inches thickness, with 8-inch, 10-inch, and 12-inch armor-piercing shell, capped and uncapped, at varying angles of impact, to determine the effect upon the armor, and also the relative value of the capped and uncapped shell in mortar firing. In these experiments the plates were required to fulfill the requirements of protective deck plates prescribed by the Navy Department. The plates were mounted on a strong oak frame and backing with the face of the plate in a vertical plane, making the desired angle with the direction of the axis of the bore of the gun, and at a suitable distance from the muzzle to interpose screens for measuring the velocity at each round. The charges used were determined to make the striking velocity in each case the same as the remaining velocity for an angle of fall equal to the angle of impact. With the 8-inch capped shell and a 3-inch plate, perforation was secured with an angle of impact of 25°. The 10-inch capped shell at 20° and the 12-inch at 15° both seriously cracked a 4½-inch plate. The results of these firings lead to the conclusion that, for relatively thin plates at least, the capped is markedly superior to the uncapped shell, even for very oblique angles of impact and relatively low velocities.

In connection with this test one 12-inch armor-piercing capped shell, charged with high explosive and detonating fuse, was fired against a 4½-inch plate, the angle of impact being 15°. The percussion part of the detonating fuse was arranged without the delay-action feature, so that it would operate with as little delay as practicable following the impact of the projectile on the plate. The effect of the shell on first striking the plate was to make a glancing indent; the projectile then moved until its base was about 12 inches from the middle of the indent, and exploded in contact with or in close proximity to the face of the plate. The explosion was a high order of detonation, and the plate was completely wrecked, the backing was nearly destroyed and moved 6 feet from its initial position, and swung round about 45°.

BREECH-LOADING SALUTING GUNS.

In my last annual report I referred to the desirability of converting 3-inch muzzle-loading guns to breechloaders for saluting purposes, owing to the occasional accidents resulting from the use of the former. During the year 20 guns have been converted and are now being issued to the service. The breech-loading guns have a sliding breechblock similar to the Hotchkiss block, and will be mounted upon cast-iron carriages arranged to be bolted to wooden or masonry platforms. The chambers have been designed to use the service 6-pounder saluting case.

The powder used in saluting charges is a potassium nitrate composition of moderate cost, and were it not for the amount of smoke going off at discharge would be satisfactory. The dissatisfaction resulting from the smoke has caused efforts to be made to substitute a smokeless powder, but so far powder makers in this country have not succeeded in their efforts to meet the wishes of the Department, owing to the occasional development of unsafe pressures. In this regard manufacturers abroad appear to have been successful, since samples of smokeless saluting powder recently obtained from them have been tested satisfactorily. The registered pressures from these latter charges were

about 3,800 pounds per square inch, indicating the powder to be safe; and judged by the noise and absence of smoke it should meet all of the requirements of service, provided it has the proper stability. At present saluting charges are placed in cartridge bags of raw silk fiber, but, when the issue of the saluting guns to the service is completed, it is planned to omit the bags and to place the powder directly into the cases, holding it in place by wads.

PRINCIPAL MATERIAL UNDER MANUFACTURE, INCLUDING THAT AT ARSENALS AND AT PRIVATE MANUFACTURERS.

Material.	To be delivered.	Material.	To be delivered.
1-pounder Hotchkiss guns, 40 calibers long.....	10	3-inch field carriages, model of 1902 ..	208
2.95-inch (75 millimeters) mountain guns.....	36	3-inch field limbers, model of 1902....	882
3-inch field rifles, model 1902.....	159	3-inch field caissons, model of 1902 ...	624
3-inch R. F. guns, model 1903.....	1	Forge limbers, model of 1902.....	52
5-inch R. F. guns.....	21	Battery wagons, model of 1902.....	52
5-inch combined R. F. and disappearing gun.....	1	Store wagons, model of 1902.....	52
6-inch R. F. guns.....	72	Store-wagon limbers, model of 1902....	52
6-inch wire-wrapped gun, experimental.....	1	3-inch objective telescopic sights, for seacoast guns.....	261
6-pounder semiautomatic guns.....	2	Panorama sights for 3-inch field carriages, model 1902.....	170
7-inch, .45 caliber, nickel steel rifles for Navy.....	24	Battery commander's telescopes.....	20
8-inch, .45 caliber, nickel-steel rifles for Navy.....	24	Front and rear sights for 3-inch field carriages, model 1902.....	208
10-inch rifles, model 1900.....	6	Range quadrants for 3-inch field carriage, model of 1902.....	208
12-inch rifles, B. L.....	15	Sights for different caliber seacoast guns.....	152
Convert wrought-iron M. L. rifles to B. L. saluting guns.....	120	Front and rear sights for 75-millimeter mountain guns.....	18
41-inch Krupp face-hardened steel shield.....	1	Automatic machine guns, caliber .30, on tripod mounts.....	90
Krupp face hardened steel plates, 92 by 48 by 5 inches.....	3	United States magazine rifles, model of 1903.....	112,000
Projectiles.....	148,500	Cavalry sabers and scabbards.....	20,000
Dummy projectiles.....	327	Officers' sabers and scabbards.....	375
Ball cartridges, caliber .30, for artillery drill cartridges.....	250,000	Ball cartridges of all kinds.....	26,102,148
Powder, pounds.....	504,529	Blank, dummy, guard, and gallery cartridges of all kinds.....	21,554,705
Fuses.....	64,000	Sets of infantry equipments.....	17,870
Fuse setters.....	12	Sets of horse equipments.....	7,217
Cartridge cases for fixed ammunition.....	113,173	Sets of cavalry equipments.....	15,173
Pressure cylinders for cannon.....	25,000	Sets of artillery harness, lead, russet.....	1,968
Standard star gauges.....	4	Sets of artillery harness, wheel, russet.....	1,014
12-inch disappearing carriages, L. F., model 1901.....	4	Woven cartridge belts.....	123,100
10-inch disappearing carriages, L. F., model 1901.....	12	Sets infantry fencing equipments.....	700
6-inch barbette carriages, model of 1900.....	45	Sets cavalry fencing equipments.....	200
15-pounder barbette carriages, model of 1902.....	60	Swasey depression position finders, type A.....	119
15-pounder barbette carriages, model of 1903.....	1	Whistler plotting boards.....	200
5-inch barbette carriages, model of 1903.....	21	Pratt's ballistic boards.....	115
6-inch disappearing carriages, L. F., model of 1903.....	70	Pack saddles for caliber .30 machine guns.....	600
75-millimeter mountain-gun carriages.....	54	Pack saddles for 75-millimeter mountain guns.....	1,152
4.7-inch siege carriage.....	1	Arm racks, model 1903 rifles.....	2,300
		Gunnery badges.....	1,700
		Pouches for first-aid packets.....	60,000

BETHLEHEM STEEL WORKS.

During the fiscal year the following work has been in progress at the Bethlehem Steel Work under the supervision of the inspector of ordnance at those works; Capt. William H. Tschappat, Ordnance Department:

1. One 5-inch combined rapid-fire and disappearing gun and carriage, contract of July 2, 1900; shipped to the Sandy Hook proving ground, June 25, 1904.
2. One 6-inch R. F. gun on pedestal mount, contract of January 11, 1901; shipped to the Sandy Hook proving ground, June 4, 1904.

3. Ten 10-inch B. L. rifles and fifteen 12-inch B. L. rifles, contract of December 14, 1901. During the year three 10-inch rifles and three 12-inch rifles were completed and proved, completing all of the 10-inch rifles and eight of the 8-inch rifles under this contract.
4. One 4½-inch steel shield, contract of May 16, 1902; shipped to the Sandy Hook proving ground with 6-inch gun and pedestal mount.
5. Five shields for 6-inch R. F. gun carriages, contract of July 12, 1902; contract completed October 16, 1903.
6. One 4½-inch steel shield, contract of August 8, 1902. This shield has been under the inspection of the navy inspector. It is bent to shape but not hardened. It is to be attached to the 6-inch pedestal mount manufactured under contract of January 11, 1901. A special cradle is required to attach this shield, and its attachment will be deferred until after the preliminary firing of the gun at the proving ground.
7. Thirty 15-pounder, 3-inch R. F. guns and barbette carriages, contract of October 15, 1902. No guns or carriages have been delivered under this contract. The company is experiencing some difficulty in providing proper artificial illumination of the reticule of the telescope. One of these guns and carriages was shipped to the St. Louis Exposition March 30, 1904, and will be returned to the manufacturers for some improvements before issue. Gun and carriage No. 4 of this contract were shipped to the St. Louis Exposition by the Bethlehem Steel Company as one of their exhibits.
8. Fifty sets of nickel steel forgings for 3-inch field gun, model of 1902, contract of December 11, 1902. The thirty-two sets remaining under this contract were delivered by November 10, 1903.
9. Thirty 15-pounder 3-inch R. F. guns and barbette carriages, model of 1902, contract of December 29, 1902. Seven of these guns are completed except breech mechanism, and the material for the mounts is on hand except the counter recoil springs, shields, and sighting apparatus.
10. One dummy breech mechanism for 15-pounder R. F. gun, contract of August 7, 1903. The mechanism has been delayed on account of changes in design, but it is expected that it will be finished in a short time.
11. Fifteen sets of nickel steel forgings for 6-inch R. F. gun, model of 1903, contract of October 19, 1903. This contract expires on January 26, 1905. Four sets of forgings have thus far been delivered, practically on time.
12. Sixteen sets of nickel steel forgings for 3-inch B. L. rifle, model of 1902, contract of December 21, 1903. This contract expired on April 1, 1904. Twelve sets only have been delivered to date.
13. Twenty sets of nickel steel forgings for 6-inch R. F. gun, model of 1903, contract of January 15, 1904. This contract expires on February 8, 1905. Four sets have been delivered.
14. One shield, complete, with shield supports, for 15-pounder barbette carriage, model of 1903, contract of May 23, 1904. This shield remains uncompleted.
15. Besides the above, work has been in progress upon miscellaneous forgings and castings required by this Department and contractors.

SCOTT FOUNDRY, READING IRON WORKS, READING, PA.

One 6-inch R. F. Brown segmental tube wire-wrapped gun and mount, contract of January 13, 1903. This construction is under an allotment from the Board of Ordnance and Fortification. On June 30 the gun had been assembled and rifled. The mount was about 95 per cent completed.

The value of the material delivered for the Department during the fiscal year was \$448,517.72.

INSPECTOR OF ORDNANCE, AKRON, OHIO.

As contracts were entered into in the early part of the fiscal year with three companies in different parts of the State of Ohio for 40 6-inch disappearing carriages, L. F., model of 1903, and with other companies for miscellaneous material, an inspection office was established in Columbus, Ohio. Capt. Lawson M. Fuller, Ordnance Depart-

ment, was temporarily assigned to duty as inspector until the arrival of the permanent inspector, Capt. J. H. Rice, Ordnance Department. This office was subsequently removed to Akron, Ohio, to which place the manufacture of 25 of the carriages was transferred, and has been charged with the inspection of material at the works of the following manufacturers, namely: Rarig Engineering Company, Columbus, Ohio; Morgan Engineering Company, Alliance, Ohio; Mansfield Engineering Company, Mansfield, Ohio; Wellman-Seaver-Morgan Company, Akron, Ohio; Firth Sterling Steel Company, Demner, Pa.; Warner & Swasey Company, Cleveland, Ohio; Crucible Steel Company of America and Carnegie Steel Company, both at Pittsburg, Pa.

Rarig Engineering Company.—A contract was entered into on August 3, 1903, with this company for twenty 6-inch disappearing carriages, L. F., model of 1903. The first carriage was to have been delivered on February 24, 1904, and the remaining nineteen carriages at the rate of one every twenty days thereafter. The company experienced great difficulty in obtaining acceptable steel castings, which resulted in a controversy between it and the subcontractor for the castings. On account of the great delay resulting from the difficulty experienced by it in obtaining suitable material, a new contract was entered into with this company on August 5, 1904, by which the twenty carriages were to be completed by the Wellman-Seaver-Morgan Company, Akron, Ohio, and a contract was entered into on August 5, 1904, with this latter company to complete them at the original contract price. Under the terms of this latter contract the first carriage is to be delivered on September 15, 1904, and the remaining 19 carriages at the rate of one every fifteen working days thereafter.

Morgan Engineering Company.—A contract was made with this company on August 3, 1903, for fifteen 6-inch disappearing carriages, L. F., model of 1903, and on April 28, 1904, another contract was entered into for ten 5-inch barbette carriages, model of 1903.

This company has made satisfactory progress in the manufacture of these carriages. The first 6-inch disappearing carriage was completed on April 20, 1904, and shipped to St. Louis, Mo., for exhibition at the Louisiana Purchase Exposition. The second carriage was completed on August 15, 1904, and the remaining 6-inch disappearing carriages have reached such a stage of completion as to enable the company to erect and subject to the prescribed shop tests three carriages at the same time.

The major part of the material required for the 5-inch barbette carriages, model of 1903, has been delivered and the necessary jigs, templates, etc., for their manufacture completed. It is believed that these carriages will be delivered on time.

Mansfield Engineering Company.—On August 3, 1903, a contract was entered into with this company for five 6-inch disappearing carriages, L. F., model of 1903. But little progress had been made in their manufacture when the company went into bankruptcy on April 12, 1904. On June 20, 1904, an agreement was entered into by the receiver of the Mansfield Engineering Company with the Wellman-Seaver-Morgan Company, of Akron, Ohio, whereby the latter company was to complete the carriages as subcontractor, which agreement was approved by the Department. Under the terms of this agreement the first carriage is to be delivered on January 5, 1905, and the remaining four by May 1, 1905.

Wellman-Seaver-Morgan Company.—This company is completing five 6-inch disappearing carriages, L. F., model of 1903, under an agreement with the receiver of the Mansfield Engineering Company, and also twenty carriages under the contract made with it on August 5, 1904.

Firth Sterling Steel Company.—On March 15, 1904, a contract was made with this company for 1,656 6-inch rendable armor-piercing shot and 936 5-inch rendable armor-piercing shot. Three lots of the 6-inch shot, representing 966 projectiles, have passed the ballistic test and are now being completed. All of the 6-inch shot have been machined and treated. Four hundred and forty-five of the 5-inch shot have been machined and 275 have been forged.

The Warner & Swasey Company.—The following contracts have been made with this company, namely: February 13, 1904, 40 Swasey depression position finders, type A; February 5, 1904, 10 3-inch objective telescopic sights, model of 1904; April 18, 1904, 261 3-inch telescopic sights, model of 1904; April 18, 1904, 20 battery commanders' telescopes.

Twenty Swasey depression position finders, type A, have been delivered and the remaining 20 were, on June 30, 1904, 75 per cent completed.

On June 30, 1904, the first lot of the 25 3-inch objective telescopic sights were 60 per cent finished and the remainder about 10 per cent. The contract for the 20 battery commanders' telescopes requires the company to complete and deliver 1 instrument for test prior to the completion of the remaining 19. This instrument was delivered on May 23, 1904, and is now undergoing test.

Crucible Steel Company of America.—On April 19, 1904, a contract was made with this company for 56 hardened protective shields for 3-inch field carriages, model of 1902, and 264 sets for 3-inch field caisson, model of 1902. On June 30, 1904, 3 sets of shields for the caisson had been delivered, 18 additional plates had passed the ballistic test, and about 300 additional plates were in process of manufacture.

Carnegie Steel Company.—On July 9, 1904, a contract was entered into with this company for 32 sets of hardened protective shields for 3-inch field carriages, model of 1902.

MIDVALE STEEL WORKS.

Capt. Ormond M. Lissak, Ordnance Department, performed the duties of inspector at the Midvale Steel Works, and at the works of 15 other contractors in the vicinity of Philadelphia, in addition to his duties as assistant to the commanding officer of Frankford Arsenal.

During the year the Midvale Steel Works did work under 41 contracts with the Department and ordnance establishments, and under 13 contracts as subcontractors, all of which have been completed except one. Thirty-nine of the 51 contracts with the other 15 contractors have been completed.

The principal material inspected by this office included 5,625 projectiles of different kinds and calibers, 406,600 pounds of steel, 2,973 feet of miscellaneous steel bars, 3,276 pieces of flange steel, 2,700 pounds of steel wire, 985 springs, 3,538 miscellaneous forgings for guns and carriages, and 9,971 miscellaneous steel castings.

THE DETRICK AND HARVEY MACHINE COMPANY, BALTIMORE, MD.

On August 19, 1903, a contract was made with the Detrick and Harvey Machine Company, Baltimore, Md., for fifteen 6-inch disappearing carriages, L. F., model of 1903, which were to be completed before December 15, 1904. On account of the difficulties experienced by the company in obtaining early deliveries of the material required for their construction, the first carriage was not completed and delivered until August 5, 1904. Two additional carriages are practically completed, and the work on the remainder well advanced. This company made a large number of jigs, templates, and gauges, and the quality of the work done by it has been excellent. These carriages are being inspected by Capt. Lawson M. Fuller, Ordnance Department, in addition to his other duties in this office.

THE UNITED STATES RAPID FIRE GUN AND POWER COMPANY—
THE AMERICAN ORDNANCE COMPANY.

The inspection work at the United States Rapid Fire Gun and Power Company, Derby, Conn., and the American and British Manufacturing Company, Bridgeport, Conn., has been in charge of Capt. W. S. Peirce, Ordnance Department, during the year. The material under manufacture by the first-mentioned company under contracts with this Department consisted principally of 15-pounder rapid-fire guns, carriages, and ammunition. About 8,000 rounds of 15-pounder steel shell ammunition remain to be delivered, of which nearly all are machined preparatory to closing the base. The design of this shell was modified to adapt it for high-explosive bursting charges. The work was somewhat delayed by this change, but the slow progress made is considered to be due in greater part to the lack of such effort on the part of the contractors as might reasonably have been expected. The material now in progress of manufacture at these works consists of 15-pounder steel shell ammunition and the conversion of twenty-five 3-inch wrought-iron muzzle-loading guns to breech-loading saluting guns.

The material under manufacture during the year by the American and British Manufacturing Company has consisted of small-caliber ammunition, 1-pounder and 75-millimeter subcaliber tubes, 1-pounder Hotchkiss guns, mounts, etc., and 3-inch field guns. The progress made by this company and the times of delivery of the material have altogether been satisfactory. This company now has on hand the conversion of seventy-five wrought-iron muzzle-loading 3-inch guns to breech-loading saluting guns, and the work has been commenced.

In addition to the material ordered by this office from the above-mentioned companies, that ordered by contractors for this Department and by commanding officers of arsenals has been inspected before shipment.

THE BUILDERS IRON FOUNDRY, PROVIDENCE, R. I.

A contract was made with this company on August 30, 1902, for the construction of thirteen 6-inch barbette carriages, model of 1900, and the work was inspected throughout the year by Capt. Samuel Hof, Ordnance Department.

The delay in the completion of these carriages is largely due to the difficulty experienced in obtaining steel castings that fulfilled the

requirements of the specifications. The first carriage was completed on May 26 and the remaining twelve are about 75 per cent completed.

ROCK ISLAND ARSENAL.

This arsenal was commanded throughout the year by Lieut. Col. Stanhope E. Blunt, Ordnance Department, U. S. Army.

Artillery store shed.—The necessity for an artillery store shed has become urgent. As the Army and militia are equipped with the new 3-inch field material, the old material turned in should be thoroughly overhauled, repaired, and stored as a reserve supply. No building is available for this purpose. The design of a suitable storehouse has been prepared and an estimate for its construction is submitted.

Hospital.—For a number of years past an estimate has been submitted for the erection of a hospital at this arsenal to replace the wooden structure temporarily erected more than forty years ago when the island was used for the detention of prisoners of war. This building is rotten, leaky, and unfit for housing the sick, or for any other purpose; it has been reported by the Inspector-General as utterly unfit for hospital purposes and not worth repairing. One hundred soldiers are stationed at this arsenal, and as the hospitals of the neighboring cities are from 2 to 3 miles away, it is at times imperative that emergency treatment be given workmen in the post hospital. The design of a hospital building has been prepared and an estimate for its erection is again submitted.

Stable.—The building now used as a stable is another of the old prison structures of the war of 1861-1865. It has become so rotten as to render repairs impossible, and its location is a menace to adjacent expensive buildings on account of its possible rapid destruction by fire. An estimate for a new building is submitted.

Storehouse.—The storehouse to replace the one destroyed by fire February 18, 1903, and for the erection of which an appropriation of \$150,000 was made on March 3, 1903, has been designed and contracted for and should be completed by December 30, 1904. It will be a highly modern structure, with fireproof floors and partitions.

Officers' quarters.—The set of officers' quarters appropriated for in the sundry civil bill approved April 28, 1904, is under construction and it is expected will be ready for occupation before the close of the present fiscal year. Quarters for additional officers will be needed in the future, but estimate is not now submitted for them as other necessities are more pressing, and, until these shall be supplied, some officers can submit to the inconvenience of living in adjacent cities.

Rock Island bridge.—The bridge was constructed and is operated by the United States; which divides the expense with the railroad companies using it. The statistics show a continual increase of traffic over it, accompanied by a decrease of river traffic through the draw.

Water power.—An extension of the power house has been completed. Two generators of 500 kilo-watts each and one of 650 kilo-watts are installed and with two exciters are operated by 20 turbines. The plant has a normal capacity of 2,200 horsepower, with permissible extreme of 3,000 horsepower. It is a beautiful and efficient installation, supplying current more than sufficient for 100 motors, aggregating 2,364 horsepower, by which the machinery of the shops is operated.

For a number of weeks last winter, and during a shorter period the

previous season, ice gorges formed in the river either below the island, backing up water in the tail race and thus reducing the head, or in the pool, cutting off the flow of water to the wheels, and in both cases greatly reducing, and for a few days entirely stopping, the power of the arsenal plant. The probability of recurrence renders desirable the installation of an auxiliary steam power plant to insure the uninterrupted operation of the arsenal.

It is believed to be possible to generate sufficient electrical power, in excess of the needs of the arsenal, to more than offset by its rental the cost of maintaining and operating the plant.

Arsenal shops.—The facilities of the shops have been increased during the year by the addition of 92 machines of various kinds, most of which were procured for the manufacture of new field artillery material. The hydraulic plant for the formation of parts of gun carriages by pressure has been in successful operation during part of the year. In the harness shop the principal item of new work undertaken has been the manufacture of pack outfits for mountain and automatic machine guns, for which purpose lock-stitch sewing machines have been installed and have proved very satisfactory, two doing the work of more than twenty men.

The principal new work undertaken in the equipment shop has been the manufacture of forks, knives, expert rifleman's badges, distinguished pistol shot badges, metal parts for the new canteen and haversack attachments for woven cartridge belts, and fasteners for these belts. The installation of automatic machinery in the equipment shop has been continued; one machine requiring but little attention makes 30,000 buckle tongues in eight hours, instead of 6,000 obtained from the older machine, which required the constant attention of an operator.

One of the most important changes in the processes of manufacture during the year has been an extensive transfer from day to piece work in the carpenter and paint shops, resulting in a reduction of cost varying from 20 to 60 per cent, although the earnings of the workmen have been increased from 15 to 30 per cent as a result of the increased output.

The machine shop, forge shop, and foundry have been principally engaged during the year in the manufacture of the new 3-inch field artillery material; a pilot 4.7-inch field carriage, model of 1904; five 6-inch barbette carriages, model of 1900; ten combined forge and battery wagons for 3.2-inch field artillery; eighty-one armament chests for 7-inch siege howitzer; and models of one-tenth size of the new 3-inch field artillery material.

The first 3-inch field carriage, model of 1902, was completed and proof fired last December. Eighty-four carriages and limbers will be completed by December 31 next, and the remaining 34 prior to the close of the next fiscal year.

The machine shop has been operated sixteen hours per day during practically the entire year, using for that purpose two shifts of machinists and machinist's helpers. It has been found necessary to introduce a number of new processes to obtain that degree of accuracy and interchangeability of parts required in the manufacture of the new field artillery material, which has been accomplished in a highly creditable manner. A hydraulic plant, consisting of a triplicate vertical pump and two hydraulic presses, having a capacity of 344 and 1,700 tons, respectively, has been installed and excellent results obtained with

it in the forming of parts having irregular shapes out of flange steel. The machining of the interior of the recoil cylinder is a difficult and complicated operation, due to the comparatively inaccessible surfaces and to the accuracy of finish required. These surfaces have been finished with such nicety that the maximum variation from prescribed dimensions in many cases does not exceed 0.0008 of an inch. The axles for the carriage, limber, and caisson are hollow, with the bore larger in the middle than at either end, and are made from a single piece of forged steel. The axles were at first purchased from private manufacturers, but as a result of the improved methods adopted at the arsenal they are now made for less than one half of the price for which they were purchased in the market. An unsuccessful effort has been made to manufacture counter-recoil springs for these carriages; experiments with that end in view will, however, be continued.

The year's output of equipments has been the equivalent of 16,000 sets of horse equipments, 25,000 sets of cavalrymen's equipments, 70,000 sets of infantry equipments, harness for 17 field batteries, and sundry pack outfits for mountain guns.

Over 2,200 workmen are now employed at this arsenal, and this number will be gradually increased during the coming year as the small-arms plant is more fully operated.

Drafting room.—During the year the following material has been designed and detailed drawings thereof prepared, namely: Battery wagon and forge limber, model of 1902; store wagon and store-wagon limber, model of 1902; 3.8-inch field carriage; pack outfits for 75-millimeter Vickers-Maxim mountain gun, for Colt's automatic machine gun, and for Vickers-Maxim automatic machine gun. In addition a large number of drawings for handbooks, working drawings for use in the shops, and drawings of the equipments made at this arsenal have been prepared. Twenty-three draftsmen are employed—an increase of over 100 per cent during the year.

Small-arms plant.—During the year 81 machines have been installed, making a total of 1,155 machines in this plant. The fixtures, dies, jigs, tools, etc., required for the completion of the plant are being manufactured at the Springfield Armory and will be completed during the present calendar year. It being essential that all parts of the rifles manufactured at Rock Island Arsenal and at the Springfield Armory should be strictly interchangeable, all gauges will continue to be made at the latter place. It is anticipated that the installation of this plant will be completed and that a daily output of 125 finished arms will be obtained by or before June 30, 1905.

A number of foremen, inspectors, and skilled mechanics have been either permanently or temporarily transferred from the Springfield Armory to this arsenal, in order that their experience and training may be utilized in starting machine operations and in the instruction of inexperienced men. Of the 90 component parts contained in the United States magazine rifle, model of 1903, the machine operations on three of the parts have been completely installed and those on 32 partially installed.

Proving ground.—To enable the field, siege, and mountain-gun carriages manufactured at this arsenal to be proof fired, a small proving ground has been established on the eastern end of the island. The surrounding country is so thickly settled that range firing can not be had. By the construction of suitable butts, however, all carriages

can be safely proof fired, thereby saving the cost of their transportation to some other point for that purpose, and familiarizing the manufacturing personnel with their performance.

Reports on material.—During the year boards of officers have investigated and reported upon the following material, namely: Pack outfit for Colt's automatic gun; gun rack and protector proposed by N. Reifal Gill & Sons; canteen with filter and pump, submitted by Thomas Kearns and T. C. Coin; McNeal's support for cavalry pack; Colonel Patterson's device for carrying rifle by mounted troops; equipment pack designed by Major Kirkpatrick and Captain Bradbury, of the Ohio National Guard; aluminum equipment kit proposed by Major Abercrombie, U. S. Army. The tests for determining the tractive force required for various widths of artillery tires on different kinds of soil and roads were concluded.

SPRINGFIELD ARMORY.

The armory has been commanded during the year by Col. Frank H. Phipps, Ordnance Department.

It is the principal small arms factory of the Department, and is now turning out rifles at the rate of 300 per day, which rate is expected to be increased shortly to 400 per day. The buildings and grounds are in good order and the entire plant is in a high state of efficiency.

Manufactures.—The following principal arms were manufactured during the year: 47,927 United States magazine rifles, caliber .30; 2,245 officers' sabers; 48,868 bayonet scabbards for United States magazine rifle, model of 1898; 15,623 stocks for issue as spare parts.

There were repaired during the year 3,279 United States magazine rifles and carbines, caliber .30, together with a large number of Springfield cadet rifles, cavalry sabers, scabbards, bayonet scabbards, and machetes. Many rifle appendages and miscellaneous spare parts have also been manufactured.

The following stores were inspected and received from manufacturers during the year: 13,650 Colt's revolvers, caliber .38; 40 Gatling guns, caliber .30, model of 1903; 100 Winchester repeating shotguns, 12 gauge, model of 1897, and 115 fixtures for the manufacture of United States magazine rifle, model of 1903, at Rock Island Arsenal, have been purchased and inspected. Two hundred and forty-nine fixtures, 915 gauges, and 27 jigs for the same arm have also been made for the Rock Island Arsenal small-arms plant.

Machines.—During the year 100 machines of various kinds, 1 electric generator, and one 40-horsepower motor were purchased and installed. Twenty-seven machines have been repaired and altered. Seventeen machines have been manufactured at the Armory.

United States magazine rifle, model of 1903.—As the fixtures, gauges, tools, etc., required for the manufacture of the United States magazine rifle, model of 1903, progressed, the manufacture of the model of 1898 rifle was gradually decreased until November last, when it ceased. The manufacture of the model of 1903 rifle has steadily progressed, the daily output being gradually increased as the completion of the fixtures, tools, gauges, etc., would permit, until a daily output of 300 rifles per day of eight hours was obtained. This output will be gradually increased to 400 rifles per day of eight hours, which output, it is anticipated, will be obtained in November next.

Experimental firings.—An experimental firing range was established near Fort Clark, Tex., last January, and a series of firings conducted for the purpose of verifying the elevation graduations on the rear sight, and for obtaining the accuracy, drift, and deviation of the bullet due to a 1-mile wind at each 100 yards range up to and including 2,000 yards. The results of these firings are now being worked up and will be included in the next edition of the description and rules for the management of the new rifle which is now being prepared.

The firings made on this range were conducted by Maj. W. C. Brown, Fifth Cavalry, to whom great credit is due for the results obtained. The firings, extending over a period of seven months, showed that the barrel of the new rifle is, as was anticipated, more rapidly eroded and worn than those of any previous model.

The erosion of the bore, which occurs principally at the seat of the bullet, is due to the chemical and mechanical action of the gases emerging from the cartridge shell at a high temperature and under a pressure of about 49,000 pounds per square inch. Experiments are being made for the purpose of obtaining, if possible, a barrel steel which will more effectively resist this action of the powder gases. Experience so far shows that erosion increases with the percentage of carbon contained in the steel, and also in the case of nickel steel, with the percentage of nickel. The erosion in barrels made of nickel steel is greater than in those made of simple carbon steel.

Telescopic sight.—Different forms of telescopic sights have been tested during the year with a view to obtaining a suitable design for issue to expert riflemen. The only promising design so far obtained is one made by the Warner & Swasey Company, of Cleveland, Ohio, which is now being tested.

Two different designs of devices for attachment to the muzzle of the United States magazine rifle, model of 1903, to decrease the effect of the energy of recoil, were tested. Although both accomplished their object, they increased the sharpness of report to such extent as to render them more objectionable than the recoil. Each also had other defects which rendered it unsuitable for the military service.

The number of employees in June, 1904, was 1,390, and the total expenditures for the fiscal year ending the 30th of that month were \$1,483,441.18.

FRANKFORD ARSENAL.

This arsenal has been commanded during the year by Lieut. Col. Frank Heath, Ordnance Department. It is the Department's factory for ammunition of all classes for small arms, for ammunition for field and siege artillery, and for seacoast artillery for caliber up to 6 inches; for gauges and inspecting instruments, and instruments for the control and direction of the fire of seacoast artillery, and for various other classes of tools and implements. Daily tests are made of the velocity and accuracy of the current output of ammunition for small arms; also tests for the waterproof quality of the ammunition, and for its comparative accuracy in competition with that produced by private manufacturers. The operations of the establishment include much preparation for issue of ammunition of all kinds, and the breaking up and remanufacture of old ammunition.

The plant has been considerably enlarged since the Spanish war, 147 new machines having been added during the past year, and has

now a capacity of about 150,000 rounds of small-arms ammunition per day; 700 artillery cartridge cases for guns of about 3-inch caliber, or the equivalent of this; 200 fuzes per day; 150 shrapnel per day, ultimately to be increased to 400 per day; besides sights, implements, and other miscellaneous articles. The new power plant referred to in my last annual report is now in operation and furnishes power to all departments at the arsenal which are motor driven. The motors are connected to the shafts by Renold or Morse silent chains, and in some cases new process rawhide pinions with cast-iron gears have been used. The group system of driving is employed in all departments except in the carpenter shop where each machine has its individual motor, belt connected. The box-making and packing shop referred to in my last annual report was completed during the year and is now in satisfactory operation. Heat, light, and power are supplied to this building from the lower plant. The space obtained by the removal of the power plant to its new building has been utilized by the concentration of the operations on lead slugs for the bullet and for the installation of 72 additional machines.

SHRAPNEL PLANT.

A building for the shrapnel plant has been completed during the year. The shafting and motors are in place and the shop is ready for the installation of the machinery.

The main work of this plant has been the manufacture of shrapnel for the 75-millimeter mountain and the 3-inch field guns. The shrapnel so far manufactured have been of the hexagonal steel case type, steel jacketed balls, with compressed base charge. It is proposed, however, to change the design of these shrapnel to one in which the case has a fluted interior and the balls are not steel jacketed.

FUZE DEPARTMENT.

Experiments have been continued during the year with centrifugal fuzes, the object sought being the development of a design embracing conditions of absolute safety in handling and transportation and certainty of action. In the case of fuzes whose action depends upon longitudinal stresses developed by the pressure of the powder gases in the gun on discharge, the conditions of safety in handling and certainty of action are opposing ones. It is impossible to meet both conditions in some cases, the stresses developed in the direction of the axis by the accidental dropping of the fuze being often higher than those developed in the gun at the time of discharge. The rapid-fire conditions and the advent of high explosives, as a shell filler, have tended to include fuzes which depend for their action upon the acceleration of the projectile in the gun except in cases where the acceleration is so great that a very high-arming resistance can be given. A fuze depending upon centrifugal forces is the natural solution of the problem, and it is proposed to use such fuzes for all calibers of projectiles inclusive of and above 2.95 inches.

Three types of centrifugal fuzes have been developed, the "F," the "S," and the "12 M." The "F" fuze is for use in detonating fuze stocks already on hand. The "S" plunger is for use in all field, siege, and seacoast projectiles, excepting the 12-inch mortar. It arms at from 2,000 to 3,000 revolutions per minute, depending upon the

gun in which it is used. The "12 M" fuze is for use in torpedo detonating fuze stocks now on hand, but the plunger is not as heavy as it should be. A new design of fuze carrying a very much heavier plunger than the "12 M" is being prepared. The plunger of this fuze will be of the service centrifugal pattern, arming at 1,300 revolutions per minute. It is expected that the energy of the blow of the firing pin of this plunger will insure certainty of action under the most severe conditions.

The following ring resistance fuzes are issued to the service: The "high C," the 1.65 inch, and the 1-pounder fuzes. These fuzes are very safe under all conditions of handling. The "high C" will not be issued when the stock on hand is exhausted. It will then be superseded by the centrifugal fuze "S."

Combination fuzes.—Investigations in connection with the development of a proper combination fuze have been continued during the year. Difficulty has been experienced in securing a powder and a method of insertion of the same that will secure a uniform rate of burning both at rest and in flight. The rate of burning is very much influenced by the ingredients of the powder used, amount of ventage given the gases of the burning train, and the pressure at which the train is inserted. The concussion plunger of the Frankford Arsenal twenty-one-second fuze is of the ring-resistance type, while the percussion plunger is of the service centrifugal type, arming at 2,500 revolutions per minute. These elements have both been tested and have given entirely satisfactory results. Twenty thousand fuzes have been purchased abroad for use while developing a satisfactory one at home.

Primers.—Important changes have been made in the primers used in the cartridge cases for fixed ammunition and separate-loading guns, the object of the change being the use of a primer having sufficient energy to thoroughly ignite smokeless-powder charges and render unnecessary the use of the objectionable igniting charges of black powder. As a result of experiments four primers have been developed and adopted—the 110-grain percussion primer, the 110-grain igniting primer, the 20-grain percussion primer, and 20-grain igniting primer. These primers cover all that are used in cartridge cases for artillery ammunition. A 110-grain electric primer has also been adopted for use in the same cases where the 110-grain primers above mentioned are used. For use with saluting charges a 20-grain primer has been adopted and is made of such dimensions that it can be used in cases for 6-pounder guns and those of higher caliber.

ARTILLERY CARTRIDGE PLANT.

This plant is equipped to manufacture all sizes of cartridge cases at present used in the service, and has been in satisfactory operation during the year. About 93,000 cases have been manufactured.

SMALL ARMS CARTRIDGE PLANT.

There were manufactured during the year 55,906,250 small-arms cartridges of all kinds.

During the year Capt. Ormond M. Lissak, Ordnance Department, continued to devote much time and attention to the designing of auto-

matic machinery for use in the manufacture of small-arms cartridges. As a result of his efforts a number of automatic machines have been perfected and installed, which not only decreases the cost of manufacture, but also the amount of floor space required for a given output. Among the machines devised by him and installed during the year are the following: A machine which inserts the springs into the cartridge clips at a rate of 9,000 per day and which performs the work of 9 hand operators; a machine which inserts the cartridges into the clips and turns down the clip springs over the cartridges at a rate of 28,000 cartridges per day. It requires 2 operators, but does the work of 5 hand operators. The attachment of an electric device to the primer inserting machine which indicates by the ringing of a bell the presence of a cartridge in the machine in which the vent has not been made. New mouth-trimming machines of an improved design have been perfected and installed. A new double-acting press for the forming at one time of three cups for the cupro-nickel bullet jacket will be installed at an early date.

The application of automatic feed hoppers to different small-arms cartridge machines has been continued during the year, and has increased the capacity of each machine from 10 to 18 per cent, and enables one operator to tend two or more machines.

Ball cartridge, model of 1903.—The manufacture of the cartridge for the new rifle has progressed satisfactorily during the year.

Efforts are also being made to develop a more suitable powder for this cartridge in order that the maximum pressure may be reduced.

Caliber .38 cartridge.—The experiments conducted for developing a primer which would fulfill the conflicting conditions imposed upon it by a revolver having a 6-pound trigger pull in single action and a 12-pound trigger pull in double action have been concluded, and a satisfactory primer adopted.

Sights for 3-inch field material.—Front and rear sights and range quadrants for two hundred and eight 3-inch field carriages, model of 1902, are being manufactured at this arsenal. In order to complete these articles at an early date, 33 machines have been installed and two shifts of workmen employed.

Plotting boards.—The manufacture of 200 Whistler plotting boards and 115 Pratt ballistic boards has been undertaken, necessitating the installation of 7 machine tools.

WATERVLIET ARSENAL.

This arsenal was commanded from the beginning of the last fiscal year to July 13, 1903, by Lieut. Col. Charles Shaler, Ordnance Department, U. S. Army, and from that date to the end of the fiscal year by Lieut. Col. D. M. Taylor, Ordnance Department, U. S. Army. It is the army gun factory, manufacturing a large percentage of the cannon of all sizes used in the military service, as well as a number of miscellaneous articles, such as spare parts and gun carriages, the latter to employ some temporarily available machines and relieve the Watertown Arsenal. There were in June last employed 490 workmen, and the expenditures for the fiscal year 1904 were \$705,165.93.

New machines in the seacoast gun shop have been arranged with a view to the use of an electric motor drive throughout the shop. The

more important machines have been equipped with individual motors and the minor machines have been arranged so that one motor may drive a group. The method of power transmission heretofore used has been exceedingly inefficient. The system of electrical distribution, therefore, promises increased economy, light, and cleanliness, and decreased danger of fire, breakdown, and personal injury. The electrical equipment of the machines involves a consideration of the source of power for the purpose. This Department has under consideration the supply of power from the Hudson River Electric Company in the form of alternating current.

Improvement in shop methods has been secured during the year and the necessary changes are proceeding as rapidly as funds will permit; they have resulted in much economy and efficiency. Experiments are now under way with a view of grinding all shrinkage surfaces of gun forgings. This has for its chief object the elimination of faults in shrinkage work, but it is also believed that the work will be done more economically. The use of grinders has been otherwise considerably increased. Special attention has been given to the tool-room department. Formerly each division of the gun shop made at least part of its tools, and working jigs were not in general use. A number of experienced tool makers have been secured and all work of this kind is being concentrated under one head. The increased use of working jigs has resulted in more accurate interchangeability of parts and generally in economy of labor. High-speed cutting steels are now in general use and all new brands are being given a conscientious trial. The alloyed steel has made a great saving in the cost of roughing work, but the most valuable results have been obtained from the use of finishing steels containing a high percentage of carbon with some tungsten. These not only permit of finishing at higher speeds but hold their keen cutting edge for a long time. In keeping the plant modern and up-to-date 30 new machines have been introduced during the year.

The work at this arsenal has been increased during the year by the introduction of work for the Navy Department, 24 guns each of 7-inch and 8-inch caliber being under manufacture at that place. The work of machining these guns was commenced on March 3, 1904, and has since proceeded uninterruptedly. It was estimated that the entire number will be completed within thirty months after the receipt of the forgings therefor, and it is hoped that with care and industry the estimate may be met.

In the field and siege gun shop additional floor space has been secured by the removal of the railroad track which formerly ran the full length of the gun shop. This, with minor changes in the location of various machines throughout the shop, promises to afford increased facilities for doing work, the necessity for which has existed for some time.

The lower shops have been principally engaged in the manufacture of spare parts and tools for seacoast and rapid-fire guns, and in addition many armor-piercing shot and shell have been altered in accordance with the latest drawings.

The manufacture of 200 carriages for 2½-inch bronze Lyle life-saving guns has been undertaken for the Treasury Department and 50 carriages and 200 quoins have been completed.

The output of work from the seacoast and siege and field gun shops during the year was equivalent to two 12-inch rifles, nine 10-inch rifles, seven 6-inch rapid-fire guns, sixteen 5-inch rapid-fire guns, forty-four 3-inch field guns, forty-eight 2.95-inch Vickers-Maxim mountain guns, and six barbette carriages.

WATERTOWN ARSENAL.

This arsenal was commanded by Col. John G. Butler, Ordnance Department, until retired as a brigadier-general on January 22, 1904; by Maj. Frank Baker, Ordnance Department, until March 26, 1904, upon which date Maj. Ira MacNutt, Ordnance Department, the present commanding officer assumed command.

The arsenal has been principally engaged during the year in the manufacture and issue of stores for the seacoast armament, requiring for that purpose practically the full capacity of the plant. The following carriages have been completed during the year, namely: One 12-inch disappearing carriage, L. F. model of 1901; two 6-inch barbette carriages, model of 1900; forty-six 75-millimeter mountain gun carriages, and one modified Spiller mortar carriage for testing 12-inch mortars.

Work is now in progress on other carriages as follows, namely: Fifteen 6-inch disappearing carriages, L. F. model 1903; three 12-inch disappearing carriages, L. F. model 1901; twelve disappearing carriages, L. F. model 1901; fifteen 6-inch barbette carriages, model of 1900; thirty-six 75-millimeter mountain gun carriages, and altering of one 12-inch mortar carriage, model of 1896, in accordance with the design prepared for strengthening the racer to permit the mortar to be fired at an elevation of 70°.

As the difficulty experienced in previous years in promptly obtaining satisfactory steel castings of small and medium size for repairs and for new work continued to greatly delay the completion of work in hand, and as the delay in obtaining small steel castings required for repairs of the armament resulted at times in serious embarrassment, a small steel casting plant, including a 2-ton converter, was installed, and has been in use since March 25, 1904. Although a few additional parts are required to complete this plant, such as a sand blast for cleaning castings, a core room and oven, excellent results have been obtained from it. Prior to June 30, 1904, 70 heats were made, amounting to 140 tons. The castings and ingots have shown excellent physical qualities and appear to be sound.

Foundry.—The wooden craneway, roof, stairway, and other parts of this building render it liable to fire, three of which have occurred during the past year. These parts should be replaced by fireproof iron constructions, an estimate for which is submitted.

Blacksmith shop.—The old engine in this shop having become worn-out has been replaced by a motor. Four new blacksmith forges have been installed, but the increased work in this shop requires several additional hammers and other tools. The same delay experienced in promptly obtaining satisfactory steel castings for repairs and new work has also been experienced in the case of steel forgings. The increase of the forging capacity so as to utilize available space and power and to better supply the needs of the machine plant is desirable.

Coincidentally with the increase of the forging capacity, a change in the forge shop from coal to gas or oil may be found expedient, since the latter fuels are more economical.

Machine shop.—The operations in this shop during the year have been much hampered by the lack of the proper facilities for handling large work. This will be shortly remedied for the larger machine tools and for the erecting shop by the installation of electrically driven traveling cranes, for which an appropriation is now available. The remedy provided for the erecting shop, however, is only partial, since the width of the building is so great and the walls so weak that it is not possible to install therein a crane capable of handling a 12-inch gun. A proper system of hoists, trolleys and trolley beams, operated by compressed air or electricity, should be provided, and has been estimated for.

High-speed tool steel has been used in the shops through the year. While the increased amount of metal removed by it compared with the old tool steel is very marked, the conditions existing in this shop are such that full advantage of this new steel can not be secured. The width of the pulleys on the main line of shafting and counter shafts, also on many of the machine tools, is not sufficient to permit the required power to be transmitted. The most suitable method of driving the larger machines is by the use of individual motors.

The installation of the steel casting plant, of the miscellaneous motors throughout the shops, and the contemplated installation of new electric cranes will render it necessary in the near future to provide a larger source of electric power, at which time individual motors should gradually be applied to the larger machines.

Carpenter shop.—The present building is now divided into two parts, the pattern shop and the carpenter shop. Its capacity is not sufficient to permit the employment of the number of pattern makers required for the current work of the arsenal; in fact, it is barely sufficient for that of the pattern shop alone, and provision should shortly be made for a new carpenter shop.

Transportation terminal facilities.—A large expense connected with the administration of this arsenal is due to the inadequate facilities for loading and unloading shipments, and for the transportation of large parts between shops. The moving of large flasks, and railroad cars in the siding is done by capstan and horse; heavy parts of carriages are moved to and from the carriage store shed by gangs of men using skids and rollers. The estimate submitted last year for the purchase of machine tools at this arsenal included a locomotive crane, but the appropriation made did not permit of its purchase; an estimate for a locomotive crane, together with other machines and tools, has been submitted.

The new barracks have been completed and were occupied on December 1, 1903.

Testing department.—In the testing department, the examination of the metal in streaked hoops has been continued, comprising hydrostatic tests of thin sections, mandrel tests on rings of the full thickness of the hoops from which they were taken, and tensile tests of the metal in both tangential and radial directions.

Tests were made to determine the resistance offered by cupronickel jacketed bullets to being forced through the bore of caliber .30 rifle barrels.

Bullets of one-fourth, three-eighths, and one-half inch length of bearing surface were forced through service barrels rifled with a uniform twist of one turn in 8 and 10 inches.

The force required to initially deform the bullets by the lands was markedly uniform. The resistance increased with the bearing length of the bullet and was generally greater with the 8 than with the 10 inch twist.

The work required to force a bullet with $\frac{1}{4}$ -inch bearing length through bores having a 10-inch and 8-inch uniform twist was found to be 38 and 42 per cent, respectively, of the total calculated muzzle energy of the bullets and work expended in forcing the bullet through the bore. This shows that less than two-thirds of the total work done by the powder gases in the bore is efficiently utilized. The report of these tests forms Appendix (2) hereto.

Recognizing the general engineering interest which attached to the strength of concrete in plain and reinforced construction, the class of industrial tests carried on by the testing laboratory has included a number of concrete columns. These columns are of such proportions as to require considerable part of the capacity of the larger testing machine in carrying their tests to destruction, and represent material in constructive sizes on engineering and architectural work. Brick piers have been tested representing the varied products of this industry as found in the New England and eastern New York yards. A number of these full-sized members, together with wooden posts, representing the chief building materials of the different sections of the country were forwarded, after testing, to St. Louis, Mo., and form a part of the testing-machine exhibit at the Louisiana Purchase Exposition.

Tests to determine the endurance of metals subjected to alternating stresses under the conditions of rotating shafts transversely loaded have been continued during the year. The results show that the number of rotations that can be made before rupture increases very rapidly as the ratio of the load applied to the tensile strength of the metal tested is decreased.

NEW YORK ARSENAL.

This arsenal, commanded by Col. John E. Greer, Ordnance Department, being mainly a purchasing and shipping agency, has no facilities for manufacturing, and its operations are necessarily those of buying, receiving, and issuing stores for the Army and Militia. It also receives through the custom-house such stores as are purchased abroad. For these purposes it is of much convenience, being in the locality which affords the best market for many of the stores which must be purchased, and of easy access from the wharves of trans-Atlantic steamers. None of the above uses can be said to constitute it an indispensable establishment of this department in time of peace. A very serviceable use for it is as a site for quarters for certain officers having duties at the proving ground at Sandy Hook; there are no quarters for these officers at the place of their duty, and to provide them would interfere with arrangements of the department with reference to the proving ground, which are believed to be of importance. The officers concerned are of rank and service such as to entitle them to the consideration of comfortable quarters for their families, and the existence of the arsenal at Governors Island permits

the provision, without imposition upon another department for erection and maintenance.

The strongest reason for the existence of a depot of the Ordnance Department upon Governors Island is the necessity for maintaining at that point a place of storage for the ordnance supplies which would be needed to equip a military expedition in time of war. The plans for Governors Island contemplate its use as an outfitting point, and as such all the supply departments of the Army have need of shipping, receiving, and storage facilities upon its territory.

The commanding officer of the arsenal is also the ordnance officer of the Department of the East, and is in addition the armament officer of the central district, whose duty it is to maintain in efficient condition the armament of the coast defenses from New York to Fort Monroe, inclusive.

AUGUSTA ARSENAL.

This arsenal, which is the headquarters of the southern armament district, has been under the command of Lieut. Col. D. A. Lyle, of the Ordnance Department. It is the depot of supplies for ordnance and ordnance stores to the troops stationed in the South Atlantic and Gulf States. Like San Antonio and Benicia arsenals, but little manufacturing is done there, but a great deal of repair work has to be done either by workmen there or by men sent out from there under the direction of the commanding officer to repair seacoast guns and carriages in place in the batteries along the coast. This brings varied and multifarious duties on the single officer there stationed, who frequently must be absent inspecting work at a distance. His force consists of a detachment of enlisted men and 17 civilian employees, with 11 machinists for the work above described.

This arsenal is the only one left in the entire South, east of the Mississippi, and the nearest constructing arsenal is nearly 800 miles distant. The location is one of the best in the South, both geographically and in its rail and water facilities, for the reception and distribution of supplies for the South.

In a memorandum of April 22, 1904, made for the Secretary of War at the call of the Senate April 13, 1904, the Chief of Ordnance drew attention to the advantage of expanding the work, both here and at Benicia Arsenal, to keep constantly in operation the metal working and carpenter shops and their accessories in the interests of repair work, which, although insistent, is always spasmodic. This can best be done by assigning to these arsenals the manufacture to a moderate extent of such ordnance stores and parts of ammunition as can be advantageously produced thereat and can be temporarily laid aside at any time to take up the repair work found necessary in the maintenance of the armament.

This at Augusta Arsenal would require only the development of its already existing facilities to permit the performance of work of a more general class than is at present possible and the employment of about fifty mechanics and laborers. An approximate estimate of cost for this change would be \$50,000.

For full utilization of the plant of buildings and ground belonging there to the Government, and the employment of about two hundred mechanics and laborers, no additional shop buildings would be needed. Those there at present, some of which were built by the Confederate

government, would suffice, requiring merely some accessory structures and a set of quarters for an additional officer. The principal outlay required would be for the machines and appliances, boilers, engines, and dynamos for the power plant, and this might be covered by an outlay of about \$200,000.

No estimates have been submitted for either of these plans and an existing objection to either of them would be the embarrassing shortage of officers referred to in another part of this report.

Attention is invited to previous reports, where it was pointed out that receipt and shipment of supplies would be facilitated by the construction of a sidetrack connecting with the electrical railway, and by the installation of electric power to a moderate degree, also to the need of building new barracks for the enlisted men, the installation of a modern system of sewerage, and increasing the water supply.

BENICIA ARSENAL.

This is an arsenal of storage, issue, and repair. The ordnance supplies stored here are for the use of the troops of the Pacific coast stations and the fortifications of that coast, as well as, to a certain extent, for troops in the Philippine Islands. The arsenal was commanded from July 1, 1903, to July 20, 1903, by Lieut. Col. John E. Greer, Ordnance Department, U. S. Army; from July 21, 1903, to September 7, 1903, by Capt. D. M. King, Ordnance Department, U. S. Army; from September 8, 1903, to March 15, 1904, by Maj. Ira MacNutt, Ordnance Department, U. S. Army, and from March 16, 1904, to the end of the fiscal year by Capt. D. M. King, Ordnance Department, U. S. Army.

The commanding officer is also the ordnance officer of the Department of California and the armament officer of the western armament district. The armament in his charge is that of the Pacific coast fortifications and light batteries stationed in the Pacific division. For keeping these in repair and for making alterations and improvements shops are maintained at the arsenal, employing in June last 59 workmen. Workmen are also sent out to fortifications upon this coast. The expenditures during the fiscal year 1904 were \$92,813.58.

During the year a considerable amount of target material was manufactured; also material for the repair of armament. A gas engine and several new machines were installed in the shops and two powder magazines of large capacity were built. A material proportion of the work of the arsenal consists of the preparation of cartridges for issue.

UNITED STATES POWDER DEPOT.

This depot has been commanded during the year by Maj. O. B. Mitcham, Ordnance Department, U. S. Army. It is a place for the storage and issue of ammunition of all kinds for the seacoast and light artillery service, and for such preparation of the ammunition as is not effected at its place of manufacture. The number of employees was, in June last, 128. The expenditures for the fiscal year 1904 amounted to \$163,982.11, largely for new construction.

The plan of the board of officers for the enlargement of the facilities of the depot for the preparation and issue of ammunition and ordnance stores, referred to in my last annual report, has been followed during the year and progress has been made.

the provision, without imposition upon another department for erection and maintenance.

The strongest reason for the existence of a depot of the Ordnance Department upon Governors Island is the necessity for maintaining at that point a place of storage for the ordnance supplies which would be needed to equip a military expedition in time of war. The plan for Governors Island contemplate its use as an outfitting point, and as such all the supply departments of the Army have need of shipping, receiving, and storage facilities upon its territory.

The commanding officer of the arsenal is also the ordnance officer of the Department of the East, and is in addition the armament officer of the central district, whose duty it is to maintain in efficient condition the armament of the coast defenses from New York to Fort Monroe, inclusive.

AUGUSTA ARSENAL.

This arsenal, which is the headquarters of the southern armament district, has been under the command of Lieut. Col. D. A. Lyle, of the Ordnance Department. It is the depot of supplies for ordnance and ordnance stores to the troops stationed in the South Atlantic and Gulf States. Like San Antonio and Benicia arsenals, but little manufacturing is done there, but a great deal of repair work has to be done either by workmen there or by men sent out from there under the direction of the commanding officer to repair seacoast guns and carriages in place in the batteries along the coast. This brings varied and multifarious duties on the single officer there stationed, who frequently must be absent inspecting work at a distance. His force consists of a detachment of enlisted men and 17 civilian employees, with 11 machinists for the work above described.

This arsenal is the only one left in the entire South, east of the Mississippi, and the nearest constructing arsenal is nearly 800 miles distant. The location is one of the best in the South, both geographically and in its rail and water facilities, for the reception and distribution of supplies for the South.

In a memorandum of April 22, 1894, made for the Secretary of War at the call of the Senate April 13, 1894, the Chief of Ordnance drew attention to the urgent necessity of expanding the work, both here and at Benicia Arsenal, to keep constantly in operation the metal working and carpenter shops and their accessories in the interests of repair work, which, although insistent, is always spasmodic. This can best be done by assigning to these arsenals the manufacture to a moderate extent of small ordnance stores and parts of ammunition, as can be advantageously and need the material can be temporarily laid aside at any time to take up the repair work found necessary in the maintenance of the armament.

For the Augusta Arsenal would require only the development of its already existing facilities to permit the performance of work of a more general class than is at present possible and the employment of a comparatively small number of mechanics. An approximate estimate of cost for this change would be \$50,000.

For the Benicia Arsenal a part of buildings and ground, belonging thereto the Government, and the employment of about two hundred mechanics and laborers, for additional shop buildings would be needed. These there at present, some of which were built by the Confederate

gency to furnish stores to other military departments, to the United States Navy, and to various departments in the Philippine civil government, settlement for the money value of these stores being made either by direct payment at the ordnance depot or by transfer made in Washington between the funds belonging to the corresponding appropriations. The proceeds of all such sales for which settlement was made at the Manila ordnance depot during the fiscal year is \$1,502.11.

SETTLEMENT OF OUTSTANDING ACCOUNTS BETWEEN THE PHILIPPINE CIVIL GOVERNMENT
AND THE ORDNANCE DEPARTMENT.

The outstanding accounts noticed in previous reports as outstanding between the civil government of the Philippine Islands and the Ordnance Department for stores furnished to the Philippine constabulary have been closed by order of the Secretary of War, pursuant to an act of Congress authorizing such settlement. The value amounted to \$119,622.23, and as an offset to this all the material and stores purchased from public civil funds and previously turned over to the Ordnance Department are permanently transferred to that department. A large proportion of this property is useless, and it will be submitted to an inspector with a view of its condemnation.

SALES OF ORDNANCE STORES TO OFFICERS.

A branch of work here, which is of great convenience and benefit to officers, is that of sales of arms and equipments, and repairs to their military equipment. The proceeds from such source during the year amounted to \$9,893.27.

POWER PLANT.

During the year the new power plant, much needed at the Manila ordnance depot, has been received, and it is now in course of installation, consisting of new boilers, an engine of 75 horsepower, a dynamo, and motors. It is proposed to provide from its power the electric light necessary for all buildings connected with the depot, and the capacity of the plant will be sufficient to meet all emergencies, even if the number or size of the buildings is increased. Electric power will be used also for running machines in the shops, and it is believed that great benefit will result from substituting this source of power, which can be applied separately to individual machines, for the complicated and antiquated shafting and gearing involved in the old Spanish power plant in use heretofore. The depot has been dependent upon private electric works in the city of Manila for its supply of electricity. This was uncertain, expensive, and intermittent, and was sufficient only for illuminating purposes. The old machinery will be sold.

Material for a nickel-plating plant has also been received, consisting of electroplating dynamo, motor, etc.

NEW OFFICE BUILDING.

During the last session of Congress an appropriation of \$16,000 was made for completing the office building in process of erection and unfinished when Manila was surrendered by the Spanish. This will probably reach completion during the present year and will allow removal of the offices from the rooms now occupied in the quadrangle inclosing the shops, leaving the vacant space to be added to the shop room.

SHOPS.

The depot is provided with armorer, saddler, carpenter, blacksmith, and machine shops, tin shop and foundry, and the space gained from the old office rooms will suffice for little more than the needed expansion of these shops for present work and the addition of the nickel-plating plant already referred to.

EXPANSION REQUIRED FOR SEACOAST DEFENSE.

Congress appropriated last year \$418,000 for beginning the work this year of the armament of fortifications in the insular possessions and estimates are made this year for \$1,511,979 more, including \$15,000 for alterations and repairs of armament and for machines to do this work at the Manila ordnance depot.

The distance of the Philippines from the United States precludes the possibility of sending heavy parts of armament home for repair, and makes it imperative to provide means for promptly repairing these and smaller parts at the Manila ordnance depot and in some instances at the batteries themselves. This will require considerable further expansion of the machine shops of the depot and the extension of the limits of the depot grounds. Recent proclamation of the President has set aside two strips of ground, embracing merely the present shops, dwellings, and houses of the depot, as an ordnance reservation, these two strips being connected at one end by a narrow strip bordering on the east wall of Fort Santiago and within the walled city, the general shape of this reservation being that of the letter U. The space separating the side strips is a plaza, which is a sort of debatable ground, being claimed by the city of Manila and held by the United States temporarily and only for military purposes.

The chief ordnance officer has pointed out the great advantage that would ensue from adding to the depot the space embraced within the walls of Fort Santiago, now used mainly for division headquarters offices, and if the division commander should find it desirable to transfer the headquarters offices, it is recommended that the needs of this Department receive consideration in the disposition of the space vacated. Attention is drawn later on in this report to the need of further storage facilities, and it is believed that no better site can be found near Manila for an ordnance establishment than the present one, especially if Fort Santiago could be added, since it is situated on the river not far from the mouth, and where but little dredging would be needed to gain the depth of water sufficient for landing and shipping heavy parts.

If the block of buildings belonging to this department, east of the new office building above referred to, should be considered more desirable for headquarters offices than Fort Santiago, an exchange could doubtless be advantageously effected.

Sufficient additional shop room will be needed for installation of a large boring mill, a large planer, and a large lathe, and a few other machines, including a shaper, milling machines, and drill press; and these will have to be placed outside the quadrangle of the present shops, as the space there is already crowded.

STOREHOUSES.

The storage facilities are insufficient for the requirements of the depot. As a result of lack of proper storage room it has been neces-

sary to store certain small arms, ammunition, and other stores in damp casemates in the old stone walls of Manila to make room in the drier storehouses for the more destructible material; to store certain artillery limbers and caissons under the eaves of the small-arms ammunition storehouse, more or less exposed to the weather, while at the present writing ten 7-inch breech-loading siege howitzers and twelve 5-inch breech-loading rifles, together with carriages, limbers, caissons, etc., are left on the plaza of the depot protected only by paulins from the weather.

ISSUE AND RECEIPT OF STORES.

The total weight of stores issued from the Manila ordnance depot during the fiscal year amounted to 1,027 tons (long) and the total weight of stores received amounted to 840 tons (long). The number of separate issues amounted to 1,535 and the number of separate receipts amounted to 1,063. One thousand two hundred and ninety-eight requisitions for ordnance and ordnance stores were received during the fiscal year.

STORES SENT TO THE LOUISIANA PURCHASE EXPOSITION AT ST. LOUIS, MO.

On November 25, 1903, the following obsolete ordnance and ordnance stores were turned over to the Philippine Exposition Board for shipment to the Louisiana Purchase Exposition, at St. Louis, Mo.:

- 1 bronze cannon, 15 centimeter.
- 1 cannon, 9 centimeter, model 1897.
- 1 Gonzales Hontoria, 7 centimeter, rifle with mount.
- 1 Nordenfeldt machine gun, caliber 1-inch, with carriage.
- 4 Nordenfeldt machine guns.
- 1 Nordenfeldt machine gun, caliber .301, about.
- 26 gas-pipe guns.
- 1 gas-pipe gun with carriage.
- 138 brass cannon, assorted.
- 8 iron cannon, assorted.
- 8 iron cannon, assorted, with carriages.
- 23 bronze cannon, with carriages.
- 2 carriages, wooden, various.
- 20 mortars, saluting.
- 1 deck platform for 9-centimeter naval gun.
- 9 carbines, various.
- 15 rifles, various.
- 6 gas-pipe shoulder guns.
- 2 shotguns, various.
- 2 muskets.
- 983 revolvers, various.
- 19 bells.
- 6 arm chests, revolver, caliber .38.
- 11 arm chests, rifle, caliber .45.
- 1,000 rifles, various; total weight, 39,145 pounds.

This property was received at the Manila ordnance depot from troops in the field, having been captured from or abandoned by the insurgents. The shipment contained some rare old specimens of workmanship and ingenuity in the manufacture of implements of war.

At the close of the Exposition these stores are to be returned to the Ordnance Department at some arsenal in the United States, when they will be listed for sale. Stores condemned at the depot: Notwithstanding every effort is made to prevent sending to the depot worthless, unserviceable stores from the field, it is necessary to condemn a large

amount so turned in. During the year 66,978 items were inspected and condemned, representing a money value, when new, of \$17,981.96. Only one sale of condemned stores was ordered by the inspector, the stores sold bringing \$18.50. The rest of this property was destroyed by the inspector.

OFFICE WORK.

The work done in settlement of property returns of officers at the Manila ordnance depot is detailed earlier in this report under the heading of similar work in the Ordnance Office.

Placing the clerical positions in the ordnance department in the Philippines under the classified service has done much toward establishing the department here on a more permanent working basis. It has given the clerks a status whereby they have some hope of reward for faithful service by employment in the United States, and it enables the department to retain the services of experienced men.

FUNDS RECEIVED AND DISBURSED.

The account of money received and disbursed under ordnance appropriations during the fiscal year is as follows:

RECEIPTS.	
Received from the Treasury	\$60,854.06
Received on account of overpayment	4.29
	\$60,858.35
EXPENDITURES.	
Disbursed during the year	\$58,317.55
Outstanding indebtedness, June 30, 1904	1,390.74
To be deposited to credit of Treasurer of United States to cover amounts deducted from salaries of employees to cover cost of transportation, etc., per agreements	571.94
To be deposited in Treasury to credit of Treasurer United States under appropriations not available here	60.00
Total	60,340.23
Unexpended balance	518.12

One thousand one hundred and forty-five dollars and ninety-four cents was deducted from the total amount allowed this depot for the fiscal year and expended in the United States for material sent from the United States for use in work at this depot. The total amount allotted this depot for the fiscal year was \$62,000.

ORDNANCE BOARD.

Membership of the Ordnance Board, June 30, 1904, is as follows:

Lieut. Col. Charles S. Smith, Ordnance Department, U. S. Army.

Lieut. Col. William L. Marshall, Corps of Engineers, U. S. Army.

Maj. R. Birnie, Ordnance Department, U. S. Army.

Maj. George L. Anderson, Artillery Corps, U. S. Army.

Capt. B. W. Dunn, Ordnance Department, U. S. Army.

Maj. M. M. Macomb, Artillery Corps, U. S. Army, was relieved from duty as member of the board by Special Orders, No. 93, War Department, Washington, December 3, 1903.

Maj. William L. Marshall, Corps of Engineers, U. S. Army, was

detailed by Special Orders, No. 160, Headquarters of the Army, Adjutant-General's Office, Washington, July 10, 1903, as a member of the Ordnance Board for duty during consideration by the board of matters pertaining to the Engineer Department.

The following is a list of the principal subjects reported upon during the year ended June 30, 1904:

Reference file No.	Subject.	Date of report.	Nature of report.
36292.....	Ehrhardt 2-inch field gun and carriage.	Sept. 23, 1903.....	Not recommended. Should it be decided to adopt a lighter equipment than the 3-inch field gun, it should be of a caliber to employ an efficient shrapnel.
25537.....	37-millimeter Vickers-Maxim 1-pounder automatic gun, with mountain equipment (supplemental test).	Dec. 30, 1903.....	Recommended for adoption in the movable armament of sea coast defenses.
37977.....	Type 15-pounder R. F. gun and mount, barbette carriage, model 1902. Bethlehem Steel Co.	Apr. 16, 1904.....	Test generally satisfactory.
31149..... 38182..... 36989.....	Types of mountain guns for service.	Sept. 29, 1903.....	Vickers-Maxim 75 millimeter mountain gun, with recommended modifications, deemed sufficiently powerful for the service.
24802.....	Bofors 6-inch R. F. gun.....	July 20, 1903 (Board of Ordnance and Fortifications).	Satisfactory.
24802.....	Breech mechanism for 6-inch R. F. guns.	July 24, 1903.....	Bofors mechanism preferred, as compared with 6-inch Vickers-Maxim and 6-inch model, 1900.
11381.....	Firing mechanisms for 8-inch, 10-inch, and 12-inch B. L. rifles, and 12-inch B. L. mortar.	Jan. 25, 1904.....	Recommending adoption of Horney firing mechanism, with changes from model of 1903, indicated.
38292.....	Lining tube for seacoast gun injured by erosion.	Aug. 19, 1903.....	Plans and computations.
35146.....	10-inch mortar carriage, model, 1900.	Aug. 11, 1903.....	Test suspended.
30160-F-205.	Experimental mechanical rammer with 12-inch disappearing carriage, model, 1901, No. 3.	June 23, 1904.....	Test unsatisfactory in the form of rammer tried. Modifications recommended.
23565-F-110.	Safety firing switch for disappearing carriages.	Mar. 26, 1904.....	Modification recommended.
25241..... 36940.....	Loading platforms for disappearing carriages at practice with subcaliber tubes.	July 28, 1903, and Nov. 13, 1903; fourth indorsement on 36940-362.	Recommending design. Amendments.
37198.....	Illumination of elevation and azimuth scales for seacoast-gun carriages.	Nov. 9, 1903.....	Recommendations as to number and kind of lights.
36862-27.....	Triple-worm gear for 12-inch B. L. rifle, model 1900.	Indorsement June 4, 1903.	Recommended.
23565.....	Temperature tests of smokeless powder.	Feb. 12, 1904; indorsement Mar. 10, 1904.	Tabulated results.
30024-N-59.	Specifications for chemical tests and for manufacture of smokeless powders.	Indorsement July 27, 1903.	Revised specifications.
35543.....	Value of (c) for 8 and 12-inch projectiles.	Indorsement Feb. 17, 1904.	Value of (c).
38375.....	Experimental 15-pounder A. P. shell submitted by the Board of Ordnance and Fortifications for Mr. Parke Shee.	Oct. 20, 1903.....	Test unsatisfactory.
38252.....	Experimental 12-inch "rendible" A. P. shot, Firth-Sterling Steel Co.	Sept. 26, 1903.....	Do.
38238.....	15-pounder A. P. steel shell, designed for high explosive charge.	Oct. 9, 1903.....	Test satisfactory.
23100.....	3-inch high explosive field shell.	Feb. 1, 1904.....	Recommended for service.
38195.....	Range firings with 75-millimeter subcaliber tube.	May 14, 1904.....	Data for range tables.
24493..... 37438.....	Comparison of cast-iron projectiles, capped, for 12-inch mortar.	Feb. 2, 1904.....	Recommended for target practice.
24171.....	5-inch cast-iron shell with bursting charge in crinoline bag.	Apr. 23, 1904.....	Not recommended. Test made.
38491.....	Bethlehem 6-pounder steel shell with ribbed cavity.	June 21, 1904.....	Recommended provisionally.

Reference file No.	Subject.	Date of report.	Nature of report.
35543.....	Deck armor with 8, 10, and 12-inch A. P. shell, capped at various angles of incidence.	May 4, 1904.....	Preliminary report. Test completed except 10 and 12 inch capped and uncapped shell against 3-inch plate.
29020.....	Test of 4.5 inch armor plates, inclined 45°, with 6-inch rifle.	July 7, 1903.....	Nickel steel plate recommended.
37811.....	4.5-inch shield for 6-inch barbette carriage.	July 31, 1903.....	Trials satisfactory.
3781.....	Forbes telemeter or range finder, binocular glass and folding base.	Aug. 31, 1903.....	Recommended for trial at Fort Leavenworth.
37845.....	Bar sight with 3-inch telescope; Warner & Swasey contract, July 18, 1902.	June 18, 1903; Oct. 6, 1903.	Recommended alterations.
35715.....	Telescopic bore sight for 8, 10, and 12 inch B. L. rifles.	Nov. 24, 1903.....	Test unsatisfactory.
37089.....	Artillery towing targets.....	Aug. 8, 1903; June 10, 1904.	Design recommended. Report of trials.
30160.....	Quadrants for 12-inch B. L. mortar.	May 20, 1904.....	Recommending design of Captain O'Hern.
4513.....	Scott automatic sight.....	Sept. 9, 1903.....	Preliminary report.
4613.....	Horizontal range finder, Warner & Swasey.	Dec. 23, 1903.....	Test favorable to its construction.
31852.....	Stang range finder (Norway).....	Dec. 22, 1903.....	Purchase of sample instrument recommended.
36020.....	Clarke automatic sight, 4.7-inch barbet carriage at Fort Wadsworth. 3-inch objective telescope sights, Warner & Swasey. For tests of substitution of Porro prisms in model 1904.	Indorsement May 4, 1904.	Recommending the Porro prisms.
37848.....			
25337.....	Grubb sight.....	Indorsement Mar. 29, 1904.	Does not compare favorably with other telescopes.
38513.....	H. L. Rodgers, Boston, Mass., range finder.	Indorsement Jan. 16, 1904.	Jan. 16, 1904. Not recommended.
38431.....	Evans, Wilkins & Co., Washington, Stewart range finder.	Oct. 30, 1903.	Not recommended.
38357.....	Thompson mechanical time fuze.	Indorsement June 27, 1904.	Test unsatisfactory.
38651.....	Hacherelle mechanical time fuze.	do.....	Purchase of sample lot of 30 recommended.
38602.....	Wilson-Lynch eccentric percussion fuze, United States Ordnance Company.	Indorsement Apr. 27, 1904.	Trial unsatisfactory.
37194.....	Jos. C. Heulings; Loeben Cannon patents.	Oct. 13, 1903.	Not considered practical and effective.
38385.....	Elliotite explosive, J. P. Elliott, Washington, D. C.	Indorsement Dec. 8, 1903.	Not satisfactory.
36329.....	E. F. Houghton & Co., Philadelphia, Pa., vici leather packing.	Jan. 9, 1904.....	Recommended.
38611.....	Motley Green & Co., New York ...	Megadyne explosive.	Sample found too sensitive in impact test.

The following papers are submitted as appendices to this report:"

Appendix 1.—Report of board on test of automatic machine guns.

Appendix 2.—Resistance offered by cupro-nickel bullets when forced through bore of caliber .30 barrel.

Appendix 3.—Test of different widths of tires with siege artillery carriages.

Appendix 4.—Experimental investigation of the contraction of the liquid vein in throttling-bar orifices of seacoast carriages.

Appendix 5.—Report of Ordnance Board on range firing with 12-inch mortars.

Appendix 6.—Report of Ordnance Board on test of field material.

Appendix 7.—Report from chemical laboratory at Sandy Hook proving ground.

Very respectfully,

WILLIAM CROZIER,
Brig. Gen., Chief of Ordnance.

The SECRETARY OF WAR.

REPORT OF THE CHIEF SIGNAL OFFICER.

REPORT OF THE CHIEF SIGNAL OFFICER.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 4, 1904.

SIR: I have the honor to submit herewith my annual report covering the operations of the Signal Corps of the Army for the fiscal year ending June 30, 1904.

For convenience of reference, field operations of the Signal Corps are treated in this report geographically under the various headings of Alaska, the Philippines, and the United States.

ALASKAN TELEGRAPH SYSTEM.

The acts of Congress approved May 26, 1900, March 2, 1901, June 30, 1902, March 3, 1903, and April 23, 1904, provide for a system of telegraph lines and cables that brings by an all-American route every military station of Alaska into telegraphic communication with the headquarters Department of the Columbia.

It will be admitted that the undertaking is unique in the annals of telegraphic engineering, whether one considers the immense extent of territory, its remoteness from the United States, the winter inaccessibility of the regions, the severity of the climate, the uninhabited and trackless districts, or the adverse physical conditions. If plotted on a map of the United States this system would reach from Wyoming to the Bahamas, off the coast of Florida. The cables used would reach from Newfoundland to Ireland, and the land lines from Washington to Texas.

Its totality also comprises elements not elsewhere combined in a single system—submarine, land, and wireless methods, all worked as one component and harmonious system. The entire construction of 3,625 miles includes not only 2,079 miles of cable and 1,439 miles of land lines, but also a wireless system of 107 miles.

The United States has brought southeastern Alaska, the Yukon Valley, and the Bering Straits region into telegraphic communication with the rest of the civilized world. There yet lacks to complete the dream of a half-century since of telegraphically uniting America and Asia via Bering Strait, a cable to the Asiatic shore and a Russian land line of about 1,500 miles to Nikolaevsk.

The Signal Corps wireless station at Nome could communicate with a similar station on the Kamchatka coast, but the infertile and sparsely inhabited country thence to the nearest Russian station of Nikolaevsk renders any such enterprise unlikely.

It is important to note that the completion of the Alaskan lines perfects the military intercommunicating system of the United States. The President or the Secretary of War can now reach, over strictly American lines of telegraph and cable, every important military command from the icy waters of Bering Strait to the tropical seas of the Sulu Archipelago, with the exception of the legation guard at Peking.

There are a score of officers, line and staff, whose energies have materially contributed to the completion of this system. Especially important have been the labors of Col. James Allen and Maj. Edgar Russel, Signal Corps, in the installation of cables, and of Capts. George C. Burnell, George S. Gibbs, and William Mitchell, and First Lieut. O. B. Grimm, Signal Corps, in building land lines, and Capt. Leonard D. Wildman, Signal Corps, in establishing a wireless system across Norton Sound.

In the line of the Army should be mentioned Brig. Gen. George M. Randall, whose pressing recommendations initiated and valuable assistance advanced the work; Gen. Frederick Funston, who has heartily cooperated; Capt. E. T. Wilson, Artillery Corps; Capt. Frederick Perkins, Eighth Infantry; Capt. J. B. Allison and Lieut. W. O. Smith, Seventh Infantry.

The following table shows the various stations on cables, wireless section, and land lines and intermediate distances:

	Inter- mediate.	Total.		Inter- mediate.	Total.
NOME-VALDEZ. (Fort Davis-Fort Liscum.)			NOME-VALDEZ—continued.		
Nome.....	0	0	Lowe River.....	3	1,391
Fort Davis.....	4	4	Fort Liscum.....	5	1,396
Safety.....	20	24	FORT EGBERT BRANCH.		
St. Michael (cable) a.....	133	157	Ketchumstock.....	0	0
Golsovia.....	35	192	Gold Creek.....	11	11
Unalaklik.....	30	222	North Fork.....	19	30
Old Woman.....	50	272	Champion Creek.....	39	69
Kaltag.....	45	317	Fort Egbert.....	29	98
Nulato.....	10	357	Boundary.....	11	109
Koyukuk.....	30	387	RAMPART BRANCH.		
Grimkop.....	20	407	Fort Gibbon.....	0	0
Louden.....	30	437	Rapids.....	35	35
Melozl.....	35	472	Rampart.....	40	75
Kokrines.....	38	510	Glen.....	35	110
Birches.....	40	550	Baker.....	15	125
Fort Gibbon.....	55	605	WIRELESS SECTION.		
Cosna.....	45	650	Safety.....	0	0
Baker.....	25	675	St. Michael.....	107	107
Tolovana.....	37	712	SEATTLE-VALDEZ CABLE. (Fort Lawton-Fort Liscum.)		
Nenana.....	55	767	Fort Lawton (land line).....	0	0
Chena.....	48	815	Seattle.....	9	9
Fairbanks.....	10	825	Sitka.....	1,070	1,070
Salcha.....	37	862	Valdez.....	640	1,719
Goodpaster.....	60	922	Fort Liscum (estimated).....	4	1,723
Central.....	32	954	SITKA-SKAGWAY CABLE.		
Summit.....	58	1,012	Sitka.....	0	0
Ketchumstock.....	54	1,066	Juneau.....	291	291
Dennison Creek.....	30	1,096	Fort William H. Seward (Haines Mission).....	102	393
Tanana Crossing.....	25	1,121	Skagway.....	21	414
Big Tokio.....	31	1,152			
Mentasta Pass.....	20	1,172			
Cheslotta.....	20	1,192			
Chistochina.....	26	1,218			
Talsona.....	20	1,238			
Kulkana.....	20	1,258			
Copper Center.....	26	1,284			
Tonsina.....	25	1,309			
Teikhell.....	24	1,338			
Salna.....	24	1,367			
Keystone.....	19	1,376			
Valdez.....	12	1,388			

aCable now inoperative. Replaced August, 1904, by wireless section, 107 miles.

INSTALLATION OF ALASKAN CABLES.

In accordance with the recommendations of the Secretary of War in his annual report of 1902, Congress authorized the connection of Seattle by cable with southeastern Alaska, where the military posts of Skagway and Fort William H. Seward (Haines Mission) were reached telegraphically only over Canadian lines.

The appropriation of \$185,000 was not made until March 3, 1903. At first sight it seemed practically impossible to install this cable or any part of it prior to the winter storms of 1903. The installation was undertaken, however, with the determination to meet, if possible, the urgent desire of the Secretary of War that one section of this cable should be in operation by the time Congress met in December.

On April 23, 1904, Congress further appropriated the sum of \$321,580 for the completion of an all-American cable route to Alaska by means of a cable from Sitka to Fort Liscum (Valdez). As this was an extension of the previous system, the subject is herein treated as a whole.

Including the Norton Sound cable, there have been laid in Alaskan waters 2,260 miles of submarine cable.

There are now installed and working the following cables in southeastern Alaska, all in first-class condition, operated by enlisted men of the Signal Corps, and already handling a large number of commercial messages, in addition to a considerable volume of official business:

From—	Miles.
Skagway to Fort William H. Seward (Haines Mission)	21
Fort William H. Seward to Juneau	102
Juneau to Sitka	291
Seattle to Sitka	1,070
Sitka to Valdez	640
Valdez to Fort Liscum	4
Aggregate	2,128

The Alaskan cable system involved not alone the telegraphic unity of American territory on this continent, but also American ability and resourcefulness in a new field. The construction, installation, and operation of long submarine cables had previously depended on foreign skill and capital. Approved methods looked to gutta-percha cables, foreign trained operators, and British cable machinery, the evolution of forty years' successful work.

After thorough investigation of the subject the Chief Signal Officer of the Army decided to install a seamless rubber cable of American manufacture, to be operated by American soldiers, and to be laid by an American ship. For several reasons it was inadvisable to replace by American skill the cable instruments and machinery, brought to such a high degree of perfection by British skill.

It may be here remarked that the radical departure as to American cables adopted by the Chief Signal Officer of the Army appears to be entirely justified. The seamless rubber cable between Sitka and Seattle, 1,070 miles in length and laid in an average depth of 1,000 fathoms and in an extreme depth of 1,700 fathoms, in addition to being less expensive in its original cost has a transmitting power greater by 25 per cent than was mathematically calculated on the basis of

trans-Atlantic gutta-percha cables. It is of military importance that in this connection a selected force of its men has been so trained in splicing, testing, and operating, that to-day the Signal Corps of the Army is competent to operate in war emergency a submarine cable of any length.

Prompt action was taken with the Alaskan cable work as soon as the first appropriation was made in 1903. The conditions of work were difficult. The cables *Burnside* was in China undergoing repairs. The cable had to be manufactured in New Jersey and transported around Cape Horn, a journey of about 12,000 miles. As to the Alaskan waters, the sea bottom was practically unsurveyed, while by shortness of days and by stormy months cable work is practically limited in these waters to five months, from May to September.

The Chief Signal Officer selected for this important duty two signal officers, Lieut. Col. (now Col.) James Allen and Capt. (now Maj.) Edgar Russel, whose cable experiences in the Philippines, in addition to their general knowledge of electrical engineering, peculiarly fitted them for the work in hand. Colonel Allen, in assuming general charge and responsibility, personally applied himself to such technical and previsionary measures as should make the work a success. Nearly all the theoretical work was intrusted by Colonel Allen to Major Russel, who drew the specifications for the manufacture of the cable, a work requiring exceptional professional knowledge and sound judgment, particularly as the limited appropriation made the work of obtaining a first-class cable thereby one of unusual difficulty. Captain Russel also organized the vitally important work of inspection, which was done by the electrical engineers of the Signal Corps, at whose head was Mr. Townsend Wolcott, an electrical engineer of marked ability and great practicality.

The contract for the construction of the cable was awarded for both sections to the lowest bidder under public proposals, the Safety Insulated Wire and Cable Company, of New York. The specifications were of a high character as regards both electrical and mechanical tests. The steel armor wire had to be specially manufactured, as a tensile strength varying from 90,000 to 120,000 pounds per square inch was insisted upon.

Through the courtesy of Mr. George G. Ward, of the Commercial Cable Company, the services of Mr. A. B. Macmillan were obtained for the instruction of selected enlisted men of the Signal Corps as cable operators. The ability of the instructor and the aptitude of the men were such that within four months operators were so trained as to be theoretically and practically competent for cable work with the latest siphon instruments.

Such energy and ability were employed by all cooperating parties that the first section of cable, 291 miles, from Juneau to Sitka, was completed on October 2, 1903, and the nearest port of the American continent to the Asiatic coast brought into telegraphic communication with the world. Delay in commercial transportation around Cape Horn made the completion of the Sitka-Seattle section impossible in 1903, although 140 miles of cable were laid southward from Sitka, the end buoyed in 600 fathoms and the remainder of the cable stored at Tacoma. Exigencies that winter recalled the *Burnside* to the Philippines for repairs of old cables and the laying of new. Owing to delays in the Philippines it was not until June that the *Burnside* was able to

resume work and leave Seattle for Alaskan operations. The cable buoyed having been carried away by winter storms, it became necessary to recover nearly all the cable laid and practically begin the work anew at Sitka. The present summer in Alaska has been exceedingly unfavorable; a series of severe gales and bad weather delayed operations and frequently endangered the cable. However, unremitting and persistent efforts on the part of Colonel Allen and his assistants completed this section on August 28, 1904.

The Sitka-Seattle cable, 1,070 miles long, was at once thrown open to public use and has since been operated most successfully, its electrical conditions exceeding anticipations.

Preparations were immediately made for installing the Sitka-Valdez cable. In order to increase the number of thoroughly trained officers in cable work, the laying of this section of 650 miles was intrusted entirely to the control of Maj. Edgar Russel, Signal Corps, Colonel Allen having reported that his thorough knowledge of technical problems connected with cable work was conjoined to unusual efficiency in practical work, as shown in the performance of his duties as executive officer in the installation of the Sitka-Seattle section.

Novel conditions obtained as regards cable transportation for the Sitka-Valdez section. As previously stated, delays in ocean transportation around Cape Horn prevented the installation of the Seattle-Sitka section in 1903. To obviate a recurrence of delays the risk was taken of transporting the entire amount of cable, 750 miles, purchased under this contract, by rail across the continent, which was successfully done in a remarkably short space of time by the Delaware, Lackawanna and Western and Northern Pacific Railway. The cable was delivered in good condition, and, as far as could be determined, suffered no injury or deterioration from rail transportation.

Major Russel sailed from Seattle September 18, the *Burnside* being crowded with cable to its utmost capacity, both cable tanks and holds, the amount being far in excess of an ordinary cargo. Such action was necessitated by the lateness of the season, as her return for a second lot was impracticable without throwing over the completion of the section until the summer of 1905. The *Burnside* having laid the Fort Liscum-Valdez cable, left Valdez for Sitka on September 29, and the end was buoyed on October 3 at Sitka. Later the shore end was landed at Sitka, and the cable system of southeastern Alaska entirely completed.

The Chief Signal Officer of the Army can not too highly commend the officers and men who have performed this extraordinary and difficult work. He especially invites attention to the ability, resourcefulness, and persistency of Colonel Allen and Major Russel, whose successful installation of this system under most unfavorable weather conditions entitle them to high rank among American officers of distinguished service.

Colonel Allen recommends Major Russel for executive ability and technical skill; Capt. Charles De F. Chandler for technical work connected with various problems relating to the cable machinery; Capt. Charles S. Wallace for his executive management. He also commends cable engineers David Lynch and Henry Winters, the former for his skill in testing and discovering faults, and the latter for laying and recovering cable. The very unfavorable weather particularly taxed the physical strength and energy of Mr. Winters. He also names, of the *Burnside* officers, Capt. A. H. Laffin and Capt. E. Heinrici for

arduous and efficient service apart from navigation. Engineers A. J. Rick and W. A. Carew were particularly resourceful in reconstructing and repairing cable machinery, especially Mr. Rick.

The enlisted force of the Signal Corps did arduous and technical work with such success as to reflect new credit on the resourcefulness of the American soldier. Colonel Allen also praises "The entire Filipino crew and cable men for activity, willingness, alertness, and reliability. The previously expressed good opinion of the services of the Filipinos as crew and cable men has been strengthened by late experiences."

It should be added that no efforts were lost on the part of Brig. Gen. Charles F. Humphrey, Quartermaster-General of the Army, and Brig. Gen. John F. Weston, Commissary-General, to facilitate through their subordinates speedy and efficient action as to supplies and services pertaining to their departments.

The celerity with which the Valdez-Sitka cable of over five hundred miles in length was put under contract, manufactured, transported, and laid, illustrates American possibilities. Congress appropriated the money on April 24, the contract was awarded, the cable manufactured in New Jersey, transported 4,800 miles by rail and sea, installed between Valdez and Sitka, and thrown open to commercial business in five months and twelve days.

INTERRUPTIONS OF ALASKAN LINES.

Experience having determined the impracticability of maintaining the cable across Norton Sound from St. Michael to Nome, owing to extended and violent movements of the winter ice, it has remained inoperative. An effort will be made to recover this cable in the summer of 1905 with a view to its utilization elsewhere. It has been successfully replaced by a wireless section as mentioned later.

The cable system of southeastern Alaska, 413 miles in length, was operated without interruption during the entire fiscal year, and a similar absence from interruptions has marked the extension of 1,070 miles to Seattle.

The land-line system of 1,497 miles was scarcely completed in June, 1903, when extensive forest fires in the valley of the Tanana, ranging for a distance of 250 miles along the line, destroyed various portions aggregating 100 miles in length. By arduous effort this line was rebuilt, and the system thrown open as a whole to the general public for commercial business before winter commenced. It has since been operated with unusual success, although interruptions here or there have been frequent, two hundred and six breaks in all, due mostly to blizzards, forest fires, sleet storms, and high winds.

The land lines were in generally good condition at the end of the fiscal year despite an unusually stormy winter, except the lines in the Tanana Valley, where the ravages of fire engrossed the entire attention of the operators and repairmen and exhausted the resources of the department. Unfortunately also all the reserve battery material and insulated wire for this section were destroyed at Fort Gibbon in the disastrous fire at that post. The loss to the Signal Corps aggregated \$11,755.34 in value, and it was impossible to replace any portion of these stores until the opening of navigation during the present summer.

On this point Capt. O. A. Nesmith, Signal Corps, in local charge, reports:

The destruction of sections of the line by fire having broken all connection between Fort Egbert and St. Michael, except locally, through communication was not established until late in August. * * * Since this date communication has been practically continuous, but owing to the lateness of the season it was impossible to put the portions of the line most affected in more than temporary repair, which resulted in interruptions more or less serious and prolonged when the season of break-up arrived. Every possible effort was made to keep communication open by constant patrolling and repairs of breaks with the least possible delay. Under these manifestly unfavorable conditions the fact that through communication, even though at times interrupted for somewhat prolonged periods, was maintained at all after the break-up is not only not discreditable but a matter of surprise and congratulation, and is solely due to the faithfulness, untiring energy, and superior ability of the men of the Signal Corps.

MAINTENANCE AND REPAIR OF ALASKAN LINES.

The maintenance of these lines necessarily devolves heavy burdens on both the Signal Corps and the garrisons in Alaska. The original plan provides three men for each station, two from the line of the Army and one from the Signal Corps. As the telegraph system has been extended the number of enlisted signalmen has been increased until, on June 30, 20 per cent of the Signal Corps was engaged on this service, excluding those serving on the cables.

The work of maintenance and repair has been under charge of Capt. O. A. Nesmith, Signal Corps, at Fort Egbert, and Captain (then lieutenant) Rickard, Signal Corps, at Fort Gibbon. The destitute conditions consequent on the disastrous fire at Fort Gibbon were remedied at the earliest moment this summer by the dispatch of funds and materials on the opening of the summer navigation. As before stated, the extended forest fires of 1903 entailed enormous efforts on officers and men.

Captain Nesmith satisfactorily exercised a general supervision of the entire line system throughout the year. He has also, with the hearty cooperation of Capt. Frederick Perkins, Eighth Infantry, efficiently supplied stations from Fort Egbert southward to Mantasta Pass and westward to Salcha, a work which involved the transfer to the interior in midwinter of 156 tons of supplies and material. He has likewise initiated the thorough repair from Salcha eastward; caused the Egbert-Valdez section to be thoroughly overhauled, and also arranged for the transfer of the Summit line, built over very mountainous and difficult country near the head waters of Forty-mile, to the middle fork of that stream, along which is the trail now used between Dawson and the Tanana.

Captain Rickard, from Fort Gibbon, most efficiently supervised the repair and maintenance of the lines in the Yukon and Tanana valleys. This duty involved much winter travel and field service of an arduous character.

The weak spots on Captain Rickard's lines is the cable at the mouth of the Koyukuk, which are being replaced by an aerial span, and the cable across the Yukon at Fort Gibbon. The Yukon River being there a mile wide makes the Gibbon crossing a problem of considerable difficulty. When the winter ice forms, and also at the coming of the spring freshets, the strongest cables are liable to complete disruption. At these times delays of a week or more are not unusual, pending the restoration of conditions under which the river can be

crossed and the cables laid. It is probable that the only satisfactory solution will be to change the route and, by building up the Yukon, cross the river by aerial steel span near Rampart.

It is not perhaps realized that every telegraph station is necessarily furnished with food and other supplies for at least one year in advance, as otherwise the men would be liable to perish of starvation. The needful material and supplies, including dog food for repair teams for telegraph stations, are regularly transported by sleds in midwinter, and in emergencies by pack animals in summer, save for stations situated on the Tanana and Yukon, which are supplied by boat in summer.

The sledding work, of great magnitude and difficulty, is marked by hardships and suffering. It involved, during the past winter, the sledding into roadless regions of the interior about 270 tons of freight, including rations, forage, dog food, etc. This work usually begins in November and is finished near the end of March. Field service is very arduous and trying, as temperatures as low as 60° below zero have been experienced in the interior. Blizzards occur occasionally and near the coast winter snowfalls are very heavy, some years exceeding 60 feet.

In the performance of this work the Quartermaster's Department of the Army has furnished promptly the special transportation needed for the purpose. The very difficult field work has been most efficiently performed almost entirely by the enlisted men of the line acting under orders of Capt. Frederick Perkins, Eighth Infantry, Fort Egbert, and First Lieut. Alexander M. Wetherill, Thirteenth Infantry, Fort Lisicum, officers whose spirit of helpfulness and cooperation are commendable examples of military solidarity.

Hard as is the duty of the freighters it is greatly preferable to that of the regular repairmen, whose services are equally arduous and much more monotonous.

Repairs are maintained by parties stationed at log cabins about 40 miles apart. Here are located one Signal Corps repairman with two assistants from the line of the Army, it being too dangerous for a single man to travel alone in stormy wintry weather, even with the dog team which is provided. Each repair detachment is provided with food for a year. Whenever an interruption of the line takes place the signalman and an assistant proceed to locate and repair it. The life of these men, thus isolated from the world, is trying in the extreme, and the dangers of repair trips, even in good weather, are very great. This is emphasized by the fact that during the past year three Signal Corps men, 3 per cent of the 105 men serving in northern Alaska, died while actively engaged on repair duty, two by drowning and one from sickness; a fourth man, a sergeant, suicided.

In short, the difficulties of the situation can only be appreciated by those having had extended personal experiences in the interior of northern Alaska, where the conditions are enormously more difficult than along the usual lines of travel.

The enlisted men, whether of the Signal Corps or of the line, meet these terrible conditions of hardship and privation uncomplainingly, and with a fortitude characteristic of the American soldier.

In this respect Captain Nesmith says:

The difficulties of the work and service in northern Alaska, together with the monotony and isolation of that service, and the demand upon the men for good judgment and physical endurance, so forcibly set forth in the last annual report, have during the past year practically continued. While the cessation of line construction

during the severe season brought some relief, the isolation of station service and loneliness and hardship of the routine work of maintaining the lines and promptly repairing breaks under all conditions were increased. The policy adopted by the Chief Signal Officer of the Army of regularly relieving the men after two years' service in Alaska has been fully appreciated, and has without doubt been a source of encouragement under difficulties and depression. Nevertheless, the discipline has been excellent and the men have cheerfully and faithfully performed their arduous duties, and it is a pleasure for the officer in charge to generally commend each man under his command.

It is a source of gratification to the Chief Signal Officer of the Army that his recommendation to Congress, favorably indorsed by the Chief of Staff and by the Secretary of War, was acted on, so that Alaskan service now counts double retirement time for the soldier.

It is the intention to relieve men in Alaska and in the Philippines by the detail of companies, which will guarantee to the men of the Signal Corps the same certainty of equitable service abroad as is granted to other branches of the service, but which indisputably has been impracticable for the Signal Corps of the Army in the past.

WIRELESS SECTION.

As has been stated in previous annual reports, efforts to establish a wireless system across Norton Sound and in the valley of the Tanana, awarded to two different companies under public proposals, entirely failed. The contract was abandoned in its primary stages in one case, while in the other the efforts proved fruitless after two or more years' work. While that in the Tanana Valley was no longer needed, owing to the construction of a permanent line through that section, it became necessary for the Chief Signal Officer of the Army to undertake through the officers and men of his corps, a wireless installation across Norton Sound. Work was commenced along two lines: First, to promptly establish the bases of a permanent plant at Safety Harbor and St. Michael, fitting them with such receivers and transmitters as were then available and perfecting the system later. Second, as the short navigable season of four months in Norton Sound rendered it impracticable to carry on experimental work in Alaska, it was decided to establish two stations in connection with the coast defenses of the United States, where they would have a permanent value, and after devising a successful typical plant, transfer its sending and receiving apparatus to Alaska.

The arrangements for the temporary plant were made under the general directions of Major (then Captain) Russel, whose special and important duty in connection with the Alaskan cable installation left him but scant time for arrangements, whose execution must necessarily be carried out 2,000 miles away by assistants not under his personal observation.

In the late summer of 1903 the Norton Sound bases were established. At Safety Harbor and St. Michael there were built portable houses, in which were installed engines, batteries, and wireless instruments, supplemented by two masts at each station 210 feet high, between which are suspended fan-shaped antennæ, consisting of 125 copper wires 1 foot apart. The motor power consists of a 5-horsepower gasoline engine and a 3-kilowatt motor dynamo, 60-cycle alternator. At each station is a transformer "stepping up" from 500 to 20,000 volts, and at the other "stepping up" from 500 to 25,000.

These poles, the highest ever erected on the Pacific coast, and antennæ were installed through the resourcefulness and professional skill of Mr. R. D. Ross, a civil engineer employed for this purpose.

Unfortunately, part of the wireless material failed to reach St. Michael owing to its shipment by the steamer *Meteor*, which was disabled en route. First Lieut. Alfred T. Clifton, Signal Corps, with a selected force of signalmen familiar with wireless work, extemporized instruments through which wireless signals of a meager and unsatisfactory character were exchanged during the winter.

Meanwhile experimental work was carried on in Long Island Sound by Capt. Leonard D. Wildman, Signal Corps, with separate and composite systems. Captain Wildman eventually devised a composite plant, originally based on the De Forest system, but largely modified by inventions of his own, as elsewhere stated. This plant worked with great success between Forts H. G. Wright and Schuyler, New York, a distance of 97 miles, of which about 20 miles was over the northwestern part of Long Island. The transfer of the typical instruments from Long Island Sound to Norton Sound was promptly and satisfactorily accomplished by Captain Wildman during the present summer. The perfection of training, simplicity, and method of installation were such that the installation was made with great facility.

Captain Wildman, at St. Michael, and Sergeant Treflinger, at Safety Harbor, installed their respective systems in less than two days. Captain Wildman reports that the wireless material was landed and delivered at St. Michael by noon of August 4, and says:

At 9 o'clock a. m. on the 6th, complete messages were exchanged, and the telegram from me at Safety Harbor was released and sent forward. No serious trouble of any kind was experienced and every part of the machinery worked in perfectly satisfactory manner. Since that time we have been pushing the machinery overloaded about 20 per cent in order to see if it could be broken down. * * * The signals are fine and louder than I have ever heard them at either the stations at Schuyler or Wright. The operators have no difficulty in reading the messages while the relay is working in the same room and with engine running in the next room and men walking about and talking in an ordinary voice anywhere in the house.

On August 17 the Nome section was thrown open for commercial business with the rest of the world, and the wireless section of the Alaskan telegraph system is now an everyday adjunct of the electrical appliances of the twentieth century. It has daily and uninterruptedly transmitted the entire telegraphic business of Seward Peninsula. In one afternoon 5,000 words were exchanged between Safety Harbor and St. Michael.

In short, through the professional skill of Captain Wildman and his subordinates, the Signal Corps of the Army is now regularly operating the longest wireless section of any commercial telegraph system in the world. It is a new illustration of the intelligence and aptitude of the American Army that this electrical installation and its operation are the work of its officers and soldiers.

ALASKAN TELEGRAPH BUSINESS.

The extent of the business interests in Alaska subserved by the Government lines discloses a volume heretofore unsuspected. During the year there has been spent \$56,935.89 for Alaskan telegrams handled by the Signal Corps alone. Of this amount there were collected on account of Alaskan line tariffs \$12,208.93, which was deposited in the Treasury of the United States as required by law. There were

also collected and turned over to other lines to which the receipts belonged the sum of \$17,539.81. This leaves the amount of \$27,187.15 collected by other lines for tariffs on messages which were sent in and out of Alaska. Of the entire volume of business, 55,559 messages, there were 31,020 commercial and 26,539 official messages, the greater part of the latter being Government business within the territory. With the connection of Nome by the wireless section and the completion of the Sitka-Valdez cable, Government receipts will very largely increase.

It is a renewed evidence of the high character of the enlisted men of the Signal Corps, and most gratifying to report that, although most of these men handled money received for telegraph tariffs, there has not been a single case of Alaskan defalcation reported, and, in addition, misconduct of any kind has been of rare occurrence.

Nor must it be thought that the amounts of money thus handled by enlisted men has been either unimportant or inconsiderable. First-class Sergt. (now Master Signal Electrician) John H. Bruck, Signal Corps, at Juneau, received and handled, without the loss of a single cent during the year, telegraph receipts aggregating \$10,237.58. At Fairbanks, Corpl. Lewis D. Shellenberger, Signal Corps, handled \$1,624.87 during the month of June.

It is already apparent that the volume of business over the Alaskan cable will be very great. Despite the low rates the tariff on messages over the Seattle-Sitka cable during September exceeded \$2,000, and the annual business is estimated at \$25,000, which will be deposited in the United States Treasury, as required by law.

EXTENSION OF ALASKAN LINES.

As far as the military administration of the Army is concerned, the Alaskan telegraph system is now complete. It is believed that the time is not far distant when private enterprise will render it possible for the Army to gradually withdraw from telegraph work in Alaska. On Seward Peninsula there have already been constructed, by Alaskan corporations, about 200 miles of telephone lines.

For administrative purposes of the Treasury Department, repeated suggestions have been advanced for the installation of a cable from Juneau southward to Ketchikan, the Alaskan port of entry. While such a cable would be most valuable for southeastern Alaska and would materially advance the interests of navigation, yet its installation is not a duty of the Army, although it could be easily installed and operated by the Signal Corps.

The question of establishing telegraphic communication with Dutch Harbor, or some other point in Unalaska, has been urged as of great national importance. It is believed that such a connection could be most economically and satisfactorily established by installing a wireless station on the western end of Nunivak Island and another at a suitable point near Dutch Harbor. The Signal Corps wireless station at Safety Harbor could work to Nunivak over the 250 miles of sea intervening, while the Navy Department could, by stations of suitable power on Nunivak and Unalaska islands, perfect the communication over the balance of the distance, which is less than 400 miles.

It is needless to say that the Signal Corps station at Safety Harbor could readily communicate with a wireless station established at a suitable point on the Asiatic shore of Bering Strait.

THE PHILIPPINE ISLANDS.

The very important work of the Signal Corps in the Division of the Philippines has been in charge, since January 1, 1904, of Maj. Joseph E. Maxfield, Signal Corps, who relieved, on that date, Maj. W. A. Glassford. The extensive land lines in the archipelago have been maintained most efficiently throughout the year, although the conditions have been unfavorable as regards the number of skilled operators available for duty. Credit is due both officers for the skillful manner in which the strictly limited force has been utilized to the best advantage.

Cable interruptions have been frequent, and, owing to causes beyond the control of the corps, have been unduly prolonged, to the detriment of the service. Major Maxfield very pertinently remarks:

The efficiency of the Philippines telegraph service, reaching, as it does, all the important islands, depends very largely upon having means at hand to repair the cables. The cable connecting Jolo and Zamboanga went down on June 10, and will have to remain unrepaired until some provision is made for a cables ship in these waters.

The positive orders, lately issued by the Secretary of War, that the telegraph service shall be maintained in the highest degree of efficiency, will prevent a recurrence of the cable experiences of the past year.

The Philippines telegraph system has rendered possible an effective executive control, not only for the Army but for the civil government, from the north coast of Luzon southward to the island of Siassi, within 60 miles of Borneo. The sixteen most important islands of the archipelago are now connected by cable. These lines are recognized as simply indispensable, both by the military and civil authorities. The testimony as to the military necessity given by all his predecessors was renewed tersely and pertinently by General Chaffee in his report of 1902, in which he says:

The service can not be curtailed because of expense for maintenance, and whatever the cost it must be cheerfully borne, for the telegraph is a very potent factor in contributing toward the maintenance of peace and order.

It has been well said by the former governor-general of the Philippines, that in no respect did the islands contrast more favorably under American control with conditions under Spanish domination than in methods of free, inexpensive, and speedy communication.

At the beginning of the fiscal year there were in operation by the Signal Corps 4,577 miles of wire, of which 3,105 were land lines and 1,472 submarine cable. These have been reduced by transfer to the civil government and abandonment so that, notwithstanding new construction for military purposes, on June 30, 1904, the total mileage of lines operated by the Signal Corps aggregated 3,520 miles, of which 2,052 were land lines and 1,468 cable. On June 30, 1904, the Signal Corps of the Army had in operation on its general system 84 telegraph offices, 13 telephone offices, exclusive of telephone exchanges in Manila and at military posts. In the operation and maintenance of these lines there were on duty at the end of the year 9 officers and 356 enlisted men of the Signal Corps, with 1 detailed officer from the line of the Army. Of the 158 civilians then employed 147 were Filipinos, of whom 83 received \$10 or less per month, 52 from \$11 to \$18 per month, and 7 above \$20 per month.

It is understood that the Constabulary lines on June 30 aggregated 4,203 miles, of which 172 were cable, 1,861 telegraph, and 2,170 tele-

phone. In connection therewith were maintained 66 telegraph offices and 197 telephone offices.

In the city of Manila the telegraphic and telephonic systems aggregate, on a single conductor basis, 174 miles in length, of which 123.4 are telephone. The military telephone system of 211 telephones now consists of one main central with a 100-drop switch board, operated both day and night, and two subcentrals operated ten hours daily. During the year 89 telephones have been installed and 52 removed. The number of calls was 291,997, an average of 745 daily. The system connects, in addition, these points outside the city limits: El Deposito, Malabon, Caloocan, Novaliches, Paranaque, and Pasig. There are also connections with points in Cavite and Laguna with Constabulary lines and with the central offices of the civil government and the commercial telephone systems in Manila.

Local telephone systems for military purposes have been established at 28 army posts and stations; they aggregate 38 miles in length and have 229 telephones in use.

The Signal Corps machine shop in Manila, in addition to repairing electrical and other instruments, furnishes power for all the telegraph lines radiating from Manila and illumination for all Signal Corps offices in the vicinity.

The line extensions have been limited to military necessities as far as the Army is concerned, but on the request and at the expense of the civil government cables have been laid extending from San Jose to Cuyo, 85.10 miles, and from Malinao to Calolbong, 29.72 miles.

There have been abandoned the following lines, 280 miles in length, which were neither necessary for the use of the Army nor desired for civil use:

	Miles.
Bugason to boundary of Antique Province, Panay	55
Punta Separacion to Alfonso XIII, Paragua	15
Davao to Reina Regente, Mindanao	210
Total	280

ADMINISTRATIVE METHODS.

Under existing conditions the signal officer of the division controls, under the commanding general, the whole system, and department officers are only responsible for repairs, local discipline, etc. While this arrangement is occasionally unsatisfactory to a subordinate commander, yet it is the only administrative system that can insure efficiency. Instances have occurred, before the necessity for unity of control was recognized, where the entire Philippines system has been interrupted and the commanding general was unable to obtain information urgently needed because of the unjustifiable interference of a subordinate officer commanding a single-company post. Fortunately, officers are learning to appreciate the very great importance of electrical communications in time of war and to recognize the important fact that a telegraph system is not local but general in its utilities.

That the development and future scope of electrical appliances for war purposes were foreseen by the military authorities is evidenced by the well-considered statement of the Secretary of War in General Order No. 1, January 20, 1879, which announces that in lines forming one connected system of telegraphy "the disabling of or interference

with any part may cause complications not possible to be contemplated in the immediate vicinity."

While the exemption of the telegraph personnel—as regards technical duties—from the unrestricted control of local commanders is sometimes unrelished, yet the importance of the duties and the peculiarity of the situation of signal corps officers and operators in times of war imperatively demand it. Under modern conditions, individual subordination is necessary in the interest of solidarity and for the public good.

The very extended application of electrical methods to the control of military operations may be said to have been first applied by the American Army in 1898. The adoption of like methods in the South African war clearly indicates that electricity will, in every future war, be a factor of great importance. Similarly, the current phases of the Russo-Japanese conflict emphasize, not only the indispensability of electrical communications for successful field operations, but as well the necessity for the control of such lines resting as fully and directly as possible in the hands of the commanding general. Indeed, every signal corps officer and enlisted man performing duties in connection with such a telegraph system is but a staff officer or confidential orderly of the commanding general.

The Chief Signal Officer recognizes that in grave military emergencies local commanding officers can and should assume control of military telegraph lines and of the entire personnel within the limits of their command. Signal officers have invariably been directed to cheerfully and loyally obey any instructions then received; but such emergencies rarely arise.

The very great importance of maintaining the present policy of local noninterference with any portions of extended systems of military telegraph lines, and the serious dangers which a departure therefrom might involve in future wars, are reasons for dwelling on this subject in an annual report; particularly at a time when existing wars have brought into especial prominence telephony, telegraphy, and wireless telegraphy as indispensable war factors.

OPERATION AND MAINTENANCE.

The best modern methods and instruments are utilized, such as common battery power, repeaters, duplexing instruments, etc. Through these improvements cable messages between Manila and the southern islands are now handled with unusual dispatch.

Owing to the great energy displayed by signal corps sergeants in charge of repair sections, the land lines have been operated almost uninterruptedly during the entire year.

The enormous volume of messages handled is evidence of the skill and faithfulness of the entire force, men and officers. Efficient and timely inspections of accounts and records have revealed the rare cases of peculations inseparable from every telegraph service, commercial or government. No cases of embezzlement of telegraph tariffs have been discovered except by the signal corps inspectors, who have promptly brought the offenders to trial. The rarity of such offenses is most gratifying, confirming, as it does, the high moral standing of the enlisted force.

The failure of men to reenlist and the great difficulty of enlisting

expert operators have made it impossible to supply men of high skill in sufficient numbers. In this respect Major Maxfield, referring to the report of Captain Clarke, regrets the deterioration of the service, due in great measure to the large number of second-class operators from the United States who are almost without experience and need service under well-trained men before they are qualified to take charge of stations. He adds:

Notwithstanding this drawback, the telegraph system has continued to render service that could well be placed on a par with that of commercial companies in the United States. This is undoubtedly due to the ability and untiring energy of the older men of the Corps, and the fact that a high class of men are enlisted who, while the time allowed between their enlistment and transfer to the Philippine Islands allows of but little preliminary instruction, enter upon the work assigned to them with great zeal and application.

The strain on operators is not merely physical, from prolonged hours of steady work, but is also nervous, partly from handling the key under high pressure and partly from climatic conditions and unfavorable environment. On this subject Captain Saltzman reports:

There is no class of Americans in the Philippine Islands so quickly debilitated by the climatic conditions of the Tropics as the telegraph operators at the more important offices. These men, who are the more expert operators, are under a constant nervous strain after one year's service in the islands, due to many hours' service each day in a small office at the telegraph table before their instruments, which are working under high pressure. After two years' service these men are almost invariably nervous and irritable, a condition conducive to "contention for circuit," errors in transmission, and other practices prejudicial to the best wire service.

As a pertinent illustration he cites:

The Lintagoup-Tucuran lines require constant repairs and keep a detachment of six enlisted men of the Signal Corps stationed at Tucuran, a station so isolated and desolate that natives will not live there, and ships do not visit the place. There are no United States troops at Tucuran, and the men are without medical attendance or commissary privileges. Excellent service can not constantly be expected from men so isolated.

The maintenance of telegraph lines in tropical regions invariably taxes administrative energy and watchfulness to the utmost, so rapid are the growth of interfering vegetation, the decay and deterioration of the original plant, and, in the Philippines, the devastation of typhoons.

One thousand miles of land lines have been carefully reconstructed during the year, while local repairs have been extensive. As far as practicable, iron poles have replaced those of bamboo and soft woods.

The efficient manner in which Major Maxfield has organized his repair service is shown in connection with the typhoon of June 24, which, lasting thirty-six hours, cut off Manila from all communication, with the exception of one single wire. Entire communication was restored by nightfall of the 25th, save one local wire and two wires south of Santo Tomas. Of this work Captain W. L. Clarke says:

The rapid restoration of communication so quickly following the storm, and most of it accomplished before the worst of the storm was over, speaks volumes for the efficiency of the signal corps district sergeants and linemen, who, in nearly every case beyond reach of this office, set forth on their own responsibility and practically had all lines up again inside of six hours.

As compared with previous years, cases of malicious interruption and hostile attacks have greatly decreased, and on most islands the lines and repairmen are undisturbed. However, there are yet localities in Panay, Leyte, and Mindanao where every repairman of the Signal

Corps is in danger of his life unless protected by a suitable escort, which is not always available.

In Luzon there were 10 malicious interruptions, two culprits being captured and punished. In Panay a sergeant with his lineman was captured, robbed, and held for ransom, but finally released. In Leyte First Class Sergt. Charles H. Ziegler, while on field duty, was ambushed by ladrones and mortally wounded, two of his escort police being killed. After being mortally wounded, Sergeant Ziegler, with great coolness and courage, killed his assailant.

TRANSFER OF PHILIPPINE TELEGRAPH LINES.

The gradual transfer of the telegraph lines from the control of the Army to the civil government, initiated in 1902, has progressed as rapidly during the fiscal year as could be expected, and will continue as may be considered desirable in the interests of the Army and of the civil government. The total amount thus transferred to June 30, 1904, aggregates, land lines and cables, 2,965 miles.

Simple methods of transfer facilitated the ends in view. Signal Corps instruments and supplies desired by the civil government were transferred to them with each section, leaving the settlement of accounts to the authorities in Washington. By the act of Congress approved April 23, 1904, these accounts were finally adjudicated.

Recognizing the great difficulties inseparable from the initiation of a civil telegraph system in the Philippines, the Chief Signal Officer has extended every facility possible in the purchase of supplies, etc., and also has repeatedly enjoined the chief signal officer, Division of the Philippines, to extend material assistance and helpful cooperation, to the utmost extent consistent with the interests of the Army. During the past year the transfers to the Philippine Constabulary of 1,020 miles of wire included all lines on the island of Negros, the entire line between Manila and Aparri, the two wires extending from Manila to Dagupan, on Luzon, and from Iloilo to San Jose, and from San Jose to Bugason, on Panay, and several shorter lines. It being practically impossible to convey a clear and adequate idea of the location and interrelation of the Signal Corps and Constabulary wires by text, there is herewith inclosed a map giving this information.

Capt. Charles S. Wallace, Signal Corps, assigned to duty at the request of the civil government, organized the Philippine telegraph service and succeeded in training a considerable force of natives for telephone and telegraph service. Captain Wallace's work is highly commended by the civil government, but his services being necessary with his own corps, he was returned to duty with it on November 20, 1903.

Major Maxfield's report indicates the character of assistance given:

The large transfer of lines made has not permitted a proportionate reduction in the personnel operating it. This is due to the fact that many of the stations transferred have been small ones, the Signal Corps still continuing to operate the main trunk lines. It has also continued to furnish the operating force at relay stations where these transferred lines join the main system, to furnish the battery for many of these lines from these relay stations, and to maintain in effective working condition a large number of lines in cases where the constabulary wires are carried upon signal corps poles.

As shown by the last monthly reports, the proportionate amount of business transmitted at the present time by the two services is: Signal

Corps, 88 per cent, and Philippine Constabulary, 12 per cent. The proportion of line receipts collected is, for the Signal Corps 78 per cent and Philippine Constabulary 22 per cent.

EXPENSES AND REVENUE.

Major Maxfield makes a detailed report of the volume of business, line receipts and expenditures, which is summarized as follows:

There have been sent during the fiscal year more than two million messages, including those relayed, and 645,173 original dispatches, which were filed as follows: By the War Department, 43 per cent; by the Navy Department, 1 per cent; by other United States departments, 2 per cent; by the civil government of the Philippines, 54 per cent.

During the year there were collected and deposited in the insular treasury, in the same manner as was done in Cuba, line receipts to the amount of \$58,675.67.

The total expenses for the maintenance of the military lines, including supplies, salaries, pay, rations, clothing, etc., of all the officers and men of the corps, and the entire expense of the U. S. transport *Burnside*, used as a cableship, from the date of her leaving the United States, January 1, 1904, to the date of her arrival in the United States, May 18, 1904, aggregates \$384,577.49. Deducting from this the line receipts deposited, as before stated, leaves the net expense \$325,901.82.

Applying the rule that a service is worth what it costs in the cheapest commercial market, the Signal Corps in the Philippine Islands has, in the past year as in preceding years, been more than self-supporting.

Ignoring the telephonic business done in Manila, of a tariff value of \$29,200, the transmission by private corporations of the official telegrams of the National and local officials would have cost the past year, by the lowest commercial rate in force in the archipelago, a sum exceeding \$480,000, this being based on the minimum tariff of the Eastern Extension Cable Company of 5 cents per word, which is a half rate given to the Spanish Government in consideration of an annual subsidy of £4,500.

OFFICERS AND MEN.

Major Maxfield testifies to the fidelity and intelligence with which the officers of the Signal Corps, without exception, have performed their arduous and important duties. Most fortunately no officer has been invalidated from the islands during the year.

The following officers of the line have been attached for duty with the Signal Corps in the Department of Luzon during the year: First Lieut. Evan H. Humphrey, Seventh U. S. Cavalry, from February 26, 1903, until November 14, 1903, and First Lieut. Archibald F. Commiskey, Seventh U. S. Cavalry, from May 26, 1903, to the end of the year. The department signal officer reports both these officers as energetic, reliable, and capable, and Lieutenant Commiskey especially has rendered much valuable assistance in the maintenance and repair of lines, being almost constantly in the field on reconstruction work.

Philippine service rests more heavily upon the signal corps men than on any other branch of the service, owing to the necessity of disproportionate signal duty in the islands. While such reductions have

been made in the troops of the line serving therein as to permit one-sixth of the enlisted men of the Army to serve in the islands at one time, such reductions have not been possible for the Signal Corps. This has been owing to the necessity of maintaining the present system of intercommunications, which, important as it is in time of peace, would be simply indispensable to efficient campaigning in war.

At the end of the fiscal year 42 per cent of the enlisted force of the Signal Corps were still serving in the islands, and fully 50 per cent of the entire corps had there served for periods ranging from two to four years. It is recognized that this condition of affairs is due to military necessities, and that the Signal Corps of the Army should perform its duties, however exacting, as should every American soldier. Fortunately relief is in prospect the coming year, through the increase of the enlisted force to 1,210 men, authorized by the act of Congress approved April 23, 1904, which, if it is possible to fully recruit the corps, will reduce foreign service in the Signal Corps to one year in two, or, perhaps a little later, to one year in three.

Notwithstanding the adverse and discouraging conditions, the enlisted men of the Signal Corps, sometimes isolated at remote and insanitary stations, have adhered to the high standard of previous years and performed their arduous duties, often regularly exceeding twelve hours per day, with cheerfulness, loyalty, and efficiency.

Captain H. W. Stamford says of the men:

While everything possible appears to have been done in the past year to improve the surroundings and conditions under which the enlisted force of the Signal Corps perform service in the Philippine Islands, the conditions are still arduous and in many instances anything but desirable. At some stations, notably Dolores and Santa Fe, Leyte, and Passi and Pototan, island of Panay, the men are practically alone, and in some cases entirely so, and surrounded by people with whom they have little in common. The loneliness of such an existence can better be imagined than described. Yet the duties of these men have been performed with zeal and willingness and they are well deserving of high commendation.

In addition, notwithstanding the tranquil condition prevailing throughout the islands, the men of the Signal Corps are still exposed to more or less danger and hardship. Assuming that the major portion of the inhabitants are friendly to our men, their duties, however, require them to traverse the roads alone in their districts and they are then constantly open to attack by lurking *ladrones* (robbers), as instanced in the cases of Sergeant Yates, captured by *ladrones* on Panay, and Sergeant Ziegler, being killed on Leyte.

VISUAL SIGNALING.

Wherever necessary the telegraph and telephone have been supplemented by visual signaling, especially in the campaigns in the Department of the Mindanao. Captain C. McK. Saltzman, who has performed most creditable field service during the year, says:

Much interest has been manifested in the department in visual signaling on account of the value of this means of communication in field operations in the Moro country. * * * Communication between the post of Marahui and the camp near the mouth of the Taraca River, on Lake Lanao, is maintained by means of visual signaling, the heliograph being used by day and the acetylene lantern by night. The station at Marahui is located on Signal Hill, formerly used by the Spaniards as one of their chain of heliograph stations between Lake Lanao and their base at Illigan, Mindanao.

During the year practical instruction has been given at all posts garrisoned by Government troops, and almost every organization in Mindanao has a signal detachment ready for field service.

RÉSUMÉ OF SIGNAL CORPS WORK IN THE PHILIPPINES.

The work of the Signal Corps in the Philippine Archipelago, doubtless unique in many phases, marks a distinct advance in the application of electricity to the art of war. In extent of mileage, rapidity of development, and number of military messages transmitted, its operations surpass those of any previous military system of communications. The cables and land lines aggregated 10,450 miles, of which 7,000 miles were operated at one time.

These lines were constructed by officers of the Signal Corps as follows:

Under Lieut. Col. R. E. Thompson, 1,156 miles, of which 268 were flying lines, 40 miles submarine cable, and 848 permanent land lines.

Under Col. James Allen, 7,903 miles, of which 607 were flying lines, 1,346 cable, 5,800 permanent land lines, and 150 telephone lines.

Under Maj. W. A. Glassford there were constructed 1,391 miles, of which 213 were submarine cable, 992 permanent land lines, and 186 telephone lines.

The reconstruction work of Maj. Joseph E. Maxfield of 1,000 miles since January 1, 1904, is not included in the above statement.

The official messages have run into the millions, and at Manila alone there were handled on a single day over one hundred thousand words. The entire cost in the first four and one-half years for material and instruments of every kind, submarine cables, and all other expenses out of signal corps appropriations aggregated \$1,381,614.41. The estimated expenses borne by other bureaus of the Army and other sources are estimated at \$1,100,000, making the direct and indirect cost of the entire plant, operation and maintenance, less than \$2,500,000.

As nearly as can be determined, each word sent over land lines during the year of active operations cost 5 mills per word; while the cost over submarine cables is 3 cents per word. This, it should be understood, includes plant, operation, maintenance, and all other expenses, taking no credit for lines, cables, or material on hand or transferred to the civil government. The estimated cost of telegrams per word over the military system in South Africa was fixed at about 7 mills per word. The foreign system, however, covered only the operations of land lines, whose original installation is less costly than submarine cables, and in the British calculations credit is taken for the full value of all stores and materials used in the construction of lines transferred after the war to the civil administration. In addition the British system counts separately relayed messages, which, although they would triple the count, are not included in the business handled by the Signal Corps.

The prices of material were practically the same in South Africa and the Philippines, so that the decreased cost of military telegraphy in the Philippines may be properly credited to the energy, skill, and resourcefulness of our soldiers. It is worthy of note that while the American soldier has higher pay his telegraphic work, done in the Philippines by ordinary field instruments and reading by sound, was at least equally efficient and more economical than the South African work, where automatic transmitters and recorders were considered absolutely necessary for the handling of the heavy traffic throughout the campaign.

The Philippines system made possible an effective executive control, not only for the Army, but for the civil government of the Philippines,

from the north coast of Luzon southward to the island of Siassi, within 60 miles of Borneo. In this system the most important sixteen islands of the archipelago have intercommunication by cable. With the advent of peace the system is properly disintegrating, partly by transfer to the Constabulary and partly by abandonment. From September 15, 1902, to June 30, 1904, there were transferred to the civil government of the Philippine Islands 2,965 miles of land lines and submarine cables. It appears, therefore, advisable to give a brief résumé of the initiation and development of the system. This résumé, further, seems to be a matter of justice to the American Army, since the similar application of electrical appliances to military purposes, lately in the South African war, and currently in the Russo-Japanese war, are so widely heralded and favorably commented upon as to convey to many the idea of an entirely new development of military communications.

The Army in 1898 found the islands practically destitute of telegraph facilities, as the destruction by insurgents of the few land lines necessarily interrupted the Visayan system of the Eastern Extension Telegraph Company. There came into the possession of the Signal Corps only about 400 miles of dilapidated and antiquated lines in northern Luzon.

The tariff value of messages sent by the Signal Corps under disturbed conditions in the Philippines can not be satisfactorily determined. It may be stated, however, that the only telegraph company in the islands, the Eastern Extension Telegraph Company—at a minimum commercial tariff of 5 cents per word charged for official telegrams—would have received for this work \$7,758,750. Attention is called to the fact, however, that the cost to the United States through the Signal Corps operations was less than one-third of this amount.

To complete the calculation there should be added the tariffs on more than two millions of telephone messages, which, at a very low rate of 10 cents per message, amount to \$200,000. There are also to be credited to the Signal Corps the tariffs, aggregating \$82,996.12, collected for commercial messages and deposited in the insular treasury.

During the insurrection, however, the service rendered was too valuable to be measured by tariff rates. During the whole of the war covering the expansion of American power from our army camps in and around Manila to the permanent occupancy of Luzon, Panay, Samar, Leyte, and Mindanao, no military operations of any extent or importance were prosecuted without attendant military telegraph or telephone service. In every important expedition the Signal Corps kept the commanding general in touch daily with his base and detached commands, and offices were often opened on the firing lines. Great as were the demands and difficult as were the conditions, the Chief Signal Officer has no knowledge, either by official report or unofficial, that the men and officers of the Signal Corps ever failed to meet the exacting demands for electrical communications.

The Signal Corps of the Army, under Lt. Col. R. E. Thompson, commenced its telegraphic construction in August, 1898, by building and operating temporary lines, which kept in communication the besieging forces of Manila. Later, in the attack on the city, the Signal Corps, carrying a flying line into Manila, opened telegraphic communication within half an hour after its occupation. On August 18 the Signal Corps repaired the Manila-Hongkong cable, cut by Admiral Dewey at the beginning of hostilities, which brought the American

Army in touch with the United States, and which was reopened for regular communication on August 21, 1898.

When Panay, Negros, and Cebu were occupied, the connecting land lines of the Visayan system of cables of the Eastern Extension Telegraph Company were rebuilt and telegraphic communication restored over these cables, one officer, Capt. George H. Tilly, Volunteer Signal Corps, being killed on May 27, 1899, at Escalante, Negros, while on this duty.

As detached commands were established in the islands of Panay, Negros, Cebu, Bohol, and Leyte, the troops were promptly brought into telegraphic communication by land lines and cables with the brigade or other headquarters, not only throughout the Visayan Islands, but also with Manila.

In Luzon, during the operations of General MacArthur toward Dagupan, of General Lawton toward San Isidro, and of General Bates in southern Luzon, field telegraph lines were constructed as the troops advanced and recovered as they withdrew; later, these were again reconstructed whenever any section of the country was permanently occupied. The rapidity of operations, and the enormous labor connected with the construction and recovery of these lines, prevented complete reports as to the exact amount of field work done. The only complete report is that of Capt. D. J. Carr, Signal Corps, which shows that he constructed and replaced in northern Luzon, in connection with MacArthur's campaign, between August, 1900, and November, 1901, not less than 1,817 miles of field line, excluding lines between Manila and San Fernando. The labors of Capt. Edgar Russel, Signal Corps, with General Lawton, were almost equally comprehensive, he constructing 953 miles in one year. These two officers built, during active operations in northern Luzon alone, 2,770 miles of field line, of which more than 800 miles were recovered, destroyed, or abandoned.

The administrative needs of an army in a tropical country were not overlooked. In Manila a modern telephone system, operated by power from dynamos and storage batteries, was installed with aerial cables aggregating 186 miles in single linear conductors and having 21 separate lines with 211 phones centering in a 100-drop switchboard.

Valuable as were the land lines, yet in the archipelago they yielded in importance to submarine cables for intercommunication between the various islands, where military operations were conducted.

As early as 1898 it became evident to the Chief Signal Officer of the Army that a comprehensive system of cables was necessary to successful military operations in the Philippines, where the only intercommunication between islands was over the cables of the Eastern Extension Australasia and China Telegraph Company, from Manila to Capiz, Panay; from Liloan to Bacolod, Negros; and from Iloilo to Cebu. This system was, however, interrupted through the destruction by insurgents of the land lines between Capiz and Iloilo, and, although later these lines were reconstructed by the Signal Corps, yet it seemed advisable to permit the extension of the English cable from Manila to Panay so as to land at Iloilo instead of Capiz.

Meantime steps were taken to provide suitable military cables. For speedy and local installation light copper-armored cable was purchased in quantities and shipped by military transports to Manila, and a temporary cable system was established in Laguna de Bay and at other points. Arrangements were also made for the purchase of deep-sea

cable, and for this purpose the first long submarine cable ever manufactured in the United States (212 miles) was sent to Manila on the U. S. transport *Hooker*. The military situation was such that it did not seem to the commanding general advisable to then connect the various islands, so that the *Hooker*, after remaining two and one-half months in Manila Harbor, was sent to Hongkong for coal. She was wrecked en route, never having been used as a cables ship but simply as a transport. This shipwreck, apparently, ended all local action for cable extensions.

However, the Eastern Extension cable between Manila and Iloilo broke in May, 1900, and, remaining unrepaired for a month, interrupted all telegraphic communication between Luzon and the rest of the archipelago, which speedily demonstrated the absolute necessity of an inter-island military system.

Gen. Arthur MacArthur, taking command during this long interruption of the English commercial cable, found it impossible to communicate promptly with any troops, except in Luzon northward of the Camarines. Important military events were sometimes a month old in the Visayan Islands, Mindanao, and the Sulu group before the information reached Manila. General MacArthur, by cablegrams, urged upon the War Department the necessity of at once completing the comprehensive cable system initiated by the Chief Signal Officer, which would bring within telegraphic reach every important military garrison in the Philippines. In his official report he says:

The wire service of the Signal Corps is simply indispensable. It is not too much to say that in the absence of this efficient service it would be impossible to hold this archipelago with less than 150,000 men, which is now well and efficiently performed by 60,000. We need wires, instruments, and operators everywhere; the more the better. It simplifies everything, makes unity of action possible, insures concentration of troops on threatened points, and altogether is of such importance that it is impossible to say too much in behalf of its indefinite extension to the limit of possible usefulness. The purpose of the present writing is to impress the War Department with the view that successful operations in these islands absolutely depend upon the Signal Corps, in consequence of which provision therefor should be made upon a scale commensurate with the importance of the interests involved.

General MacArthur's recommendations, concurred in by the Chief Signal Officer, were promptly approved by Secretary of War Root, and an allotment made therefor from the emergency fund. The plan contemplated intercommunication between all the principal islands and the establishment of alternative telegraphic routes to points of the greatest value to the military administration.

The Chief Signal Officer immediately arranged for the construction of large quantities of American submarine cable, which were transported to the Philippine Islands, partly by commercial steamers and partly in Government ships, especially the Quartermaster's transport *Burnside*, which was fitted up with the most modern appliances as a cables ship.

Such dispatch was made in the manufacture, shipment, and installation that by October, 1901, the telegraph system of the Philippines was completed and in working order. The islands of Basilan, Boac, Bohol, Corregidor, Cebu, Jolo, Leyte, Luzon, Masbate, Mindanao, Mindoro, Negros, Panay, Samar, and Siassi were all in telegraphic communication. The cable recovered from the wreck of the *Hooker* was used in connecting Liloan, Cebu, and Ormoc, Leyte; Liloan and Cebu; and Tacloban, Leyte, with Samar.

In connection with the insurrection in Samar, following the Balangiga massacre, an extensive system of flying telegraph lines was constructed, connecting points of military importance and contributing materially to the successful suppression of the insurrection.

In southern Luzon similar telegraphic facilities were afforded Gen. J. Franklin Bell, who, at the end of the campaign which resulted in the establishment of peace in Luzon, says:

Mail facilities are so very slow and uncertain in this brigade that, had it not been for the exceptionally valuable service rendered by the Signal Corps in connection with my work here, I feel morally certain that I could not have accomplished in six months what has already been accomplished in six weeks. * * *

In the campaign caused by the rising of the Moros in Mindanao comprehensive systems of telegraph and telephone lines were built in the Lake Lanao region, connecting the military camps with the cable stations at Malabang and Iligan.

These lines have not alone been potent factors in the preservation of peace and public order, but they have subserved very greatly the extensive and persistent efforts of the civil government to foster the agricultural, commercial, and other interests of the islands. They have also stimulated trade and industrial pursuits, as well as facilitated all work of an administrative or executive character.

As an illustration of the aid rendered National officials engaged in civilian work may be quoted the letter of Gen. J. P. Sanger, U. S. Army, director of the Philippine census bureau:

* * * Since January 1, 1903, almost the entire correspondence of the bureau has been by telegraph, and during this period I have sent and received nearly ten thousand telegrams and cable messages, many of them at great length and a large proportion of them in the Spanish language.

With the exception of a few errors—due, no doubt, to idiomatic and obscure phrases, requiring occasional repetition—the work has been carried on with such skill and dispatch as to merit special commendation; and before leaving Manila I wish to express to the members of the Signal Corps performing the duties of telegraph operators my high appreciation of their efforts and of the excellent organization and administration of the telegraph service.

The value of telegraphic service in the Philippines to commerce and trade may be estimated by the statement that in 1901 it was found by tests that it required, on an average, thirty days to obtain an answer—when made immediately by the recipient—to communications sent by post from Manila to the principal towns on Luzon. In connection with other islands delays of two or three months were not unusual.

With a view of developing commercial enterprises and stimulating interisland trade, military lines on the island of Panay were, in February, 1900, thrown open to commercial business, under conditions conserving the military interests of the United States.

The Chief Signal Officer of the Army, after personal consultation with the governor of the Philippine Islands and the commanding general, made arrangements in June, 1901, which largely increased the telegraphic facilities for commercial business. Every office in the archipelago was opened to insular commercial messages, while 60 of the larger offices were accorded facilities for foreign cablegrams. Recognizing the distressed financial condition of the islands, an unusually low tariff was fixed—that of 2 cents per word between points on the island and 4 cents per word beyond points on the island from which the message originated. Believing that the same methods should and

would be followed in the Philippines as prevailed in Cuba, the receipts from commercial messages were deposited in the insular treasury.

In so far as is consistent with the interests of the United States, the most liberal policy was pursued toward the civil government from its inauguration on July 4, 1901, and that government, in turn, has invariably reciprocated in the maintenance of harmonious relations. All business of the civil officials of the civil government has been transmitted free over the military lines, and, on the other hand, as an offset, the civil government has made from time to time appropriations for the operation of lines maintained almost exclusively for insular use. The act of February 24, 1904, recognized such relations and adjusted accounts in connection therewith. It may be added that similar conditions yet obtain, and will, unless otherwise directed, continue until the transfer of the lines to the civil government is practically complete.

While the burdens upon the Signal Corps have been arduous in the Philippine Islands, yet the Chief Signal Officer congratulates the Corps upon the unprecedented opportunity it has had, while subserving and upbuilding the commercial and industrial interests of the archipelago, to acquire that practical knowledge of military telegraphy, telephony, and other work which adds to their value as defenders of their country.

OPERATIONS IN THE UNITED STATES.

Great as are the interests of the work in Alaska and the Philippines, they are now exceeded in military importance by developments in the United States in connection with fire-control communications for sea-coast artillery, with electrical installations at posts, and necessary provisions for maneuvers and field camps.

MILITARY DEPARTMENTS.

Under paragraph 1594, Army Regulations, department commanders supplement the operations of the Signal Corps by such instruction in visual military signaling as they deem necessary for the public service. The instruction in the line of the Army contemplates that each independent command should have at least two enlisted men able to exchange messages in the army and navy code at short distances by flag. Deficiencies in instructing the line of the Army in military signaling has, in part, resulted from inability to assign a signal officer to each military department. Of the nine departments in the United States it has been possible to supply only three throughout the year with a signal officer.

At the end of the fiscal year these signal officers were as follows:

Department of the East, Col. James Allen, temporarily absent; Capt. George C. Burnell, acting. Department of the Gulf, Maj. William A. Glassford. Department of Texas, Capt. E. O. Feché. Department of California, Maj. George O. Squier, on leave of absence; Capt. P. W. West, Eleventh Cavalry, acting. Department of the Columbia, Lieut. Col. R. E. Thompson. Department of the Colorado, Capt. William Mitchell. Department of the Missouri, First Lieut. W. L. Karnes, Sixth Cavalry. Department of Dakota, First Lieut. W. S. Grant, Third Cavalry. Department of the Lakes, Lieut. K. P. Williams, First Infantry.

Several other officers of the line have also served as department

signal officers for brief periods, performing these duties in addition to others having a prior claim. Under these conditions the Signal Corps has been fortunate in obtaining in all cases good, and in some cases very efficient, service from detailed officers.

Save in the Departments of California and the East, signal operations have been largely confined to routine work. Apart from matters treated under separate heads may, however, be mentioned the following: The Department of the Missouri appears to be best trained as regards visual signaling, having 21 officers and 130 men proficient in the army and navy code. In the Department of Texas, attention is being given to the neglect and improper treatment of telephones and heliographs.

DEPARTMENT OF CALIFORNIA.

Although for years there has been much important signal work in this department, especially that connected with operations in the Philippines, yet the facilities for such work were so limited as to impair the efficiency of the corps. Maj. Gen. Arthur MacArthur, commanding, recognizing the impossibility of field work by a company not even having separate barracks, recommended the assignment of Company C, Signal Corps, then at Angel Island, to Benicia Barracks. This recommendation, approved by the Chief of Staff, has placed this Signal Corps command in a position to properly acquire theoretical and practical knowledge suited to the needs of the Army in peace or in war. The garrison now at Benicia Barracks consists of Companies C and I, Signal Corps, the latter being under orders to relieve Company F in the Philippines. Company C includes in its personnel all enlisted men who may be serving in the Division of the Pacific, except those pertaining to the Alaskan telegraph lines. Instruction in military drill, visual signaling, telegraph, and line work has been prosecuted satisfactorily, considering the large number of recruits and the necessity of frequent details for Alaskan and Philippine service. Favorable reports of this post and of its command have been received, both in connection with its garrison duties and technical work at the maneuvers in the Departments of California and of the Columbia.

The electrical communications of San Francisco Harbor have been put in excellent condition by the installation of a three-conductor cable between the Presidio of San Francisco and Fort Baker in February.

In compliance with the desire of General MacArthur, a course of lectures and practical instruction in electricity and fire-control apparatus for the officers of the Artillery Corps at the Presidio was given at that post by Maj. George O. Squier, department signal officer, assisted by the electrical engineer of the Signal Corps. The course of eight lectures embraced a comprehensive review of Ohm's law, circuits, electrical measurement, batteries, magnets, the dynamo, the electric light, telegraphy, telephony, and wireless telegraphy.

DEPARTMENT OF THE EAST.

The conditions affecting the efficiency of the Signal Corps in this department have been materially improved by the transfer of Company G, Signal Corps, from Fort Trumbull, Conn., to Fort Wood, New York Harbor. It is contemplated that this company shall

eventually care, in addition to ordinary signal duty, for all fire-control installations in the Division of the Atlantic. To this end arrangements are being made at Fort Wood for the thorough instruction of the enlisted men in such classes of electrical work as pertain to fire control, telephonic exchanges, and telegraph systems.

In addition to its other duties this company is charged with the care and lighting of the Statue of Liberty, which is situated within the limits of the post. An inspection by an electrical expert before Company G took station at Fort Wood disclosed the necessity of extensive repairs for the proper care of this statue, in which two great nations have a mutual interest. Since occupancy, conditions have been materially improved by the skill and resourcefulness of the officers and men of the Signal Corps at Fort Wood, but a considerable appropriation will be necessary to place this statue in that condition which the interest of the public and the credit of the nation demand.

In addition to the electrical work at Fort Wood, signal corps men have been assigned to the operation of the electric-light installation on Governor's Island.

Fort Ethan Allen, Vt., has been provided with telegraphic connections, and similar arrangements for affording proper communication with other large garrisons in the department are under consideration, and will be carried out as soon as the enlisted force of the Signal Corps is sufficiently recruited.

SIGNAL CORPS POST, FORT MYER, VA.

The command of this important post and school of instruction has been exercised by Col. H. H. C. Dunwoody, Signal Corps, during the entire year.

The primary function of the post is the instruction of untrained officers and men, while secondarily it serves as a depot of repairs and issues. Its value as a school of instruction is shown by the fact that 150 enlisted or transferred men have joined during the year. There have been trained and sent to foreign service 90 enlisted men, while 50 others, after preliminary training, have been sent as assistants to telegraph and signal stations in Arizona, Utah, etc. The necessities of the service have reduced the period of instruction to four and one-half months, too limited a time for proper training. The excellent quality of the recruits and character of the garrison are shown by the fact that despite the deplorable and demoralizing surroundings that have grown up since the canteen system was modified, there have been during the year but 11 trials by court-martial and 22 by summary court.

Large quantities of surplus and unserviceable signal property have been received at the post. No less than 200 tons of supplies and materials have been shipped from the post. The transportation facilities, though adequate, are expensive, as all supplies have to be hauled 6 miles by wagon.

In the interest of economy and efficiency subdepots have been established at Benicia Barracks, Cal.; Fort Wood, N. Y., and Seattle, Wash., to which will shortly be added Fort Leavenworth, Kans.

There have been 15 officers at the post, of whom no less than 12 needed military or professional training. There has been a lack of trained officers to furnish complete technical instruction for detailed

officers, the commanding officer being unable to do much more than supervise military training. Instruction of officers has necessarily been confined to the most urgent phases of a practical nature, much to the injury of the service and to the detriment of individual officers.

The relations of the two independent posts at Fort Myer—the cavalry and the signal corps posts—have been most harmonious, Colonels Edgerly and Wallace having invariably cooperated with Colonel Dunwoody in all matters affecting the interests of both posts.

Recognizing the inherent difficulties of the situation, the Chief of Staff, after consultation with the Chief Signal Officer of the Army, recommended that the signal corps post at Fort Myer, Va., be vacated by the Signal Corps, and that the main post of instruction be transferred to Omaha Barracks, which was approved by the Secretary of War.

Under this authority old Fort Omaha is being arranged for reoccupation with a view to the quartering there of a battalion of four companies of the Signal Corps. Work is in progress for such repairs as will enable a single company to be stationed at that point.

It is intended that there shall be here located the general school of instruction for the enlisted men in signaling, telegraphing, telephoning, ballooning, etc. There will also be established, in efficient condition, field telegraph trains, balloon trains, and other special apparatus needed for field communications in time of war. Estimates have been submitted by the Quartermaster-General for the construction the coming year of such quarters, barracks, and other buildings as are necessary.

MILITARY TELEGRAPH LINES.

The following military lines were in operation at the end of the fiscal year:

From—	To—	Length.	Messages handled.
		<i>Miles.</i>	
Price, Utah.....	Fort Du Chesne, Utah.....	87.0	4,623
Fort Huachuca, Ariz.....	Lewis Springs, Ariz.....	19.0	2,499
Willcox, Ariz.....	Fort Grant, Ariz.....	28.0	a 598
Holbrook, Ariz.....	Fort Apache, Ariz.....	92.0	7,946
Fort Bayard, N. Mex.....	Bayard, N. Mex.....	3.0	a 963
Washington, D. C.....	Fort Washington, Md.....	21.5	b 1,610
Fort Niobrara, Nebr.....	Valentine, Nebr.....	4.5	1,863
Fort Bliss, Tex.....	El Paso, Tex.....	6.0	948
Fort Brown, Tex.....	Fort McIntosh, Tex.....	237.0	18,281
Fort Clark, Tex.....	Spofford Junction, Tex.....	9.5	2,524
		507.5	41,805

a Two months.

b Seven months.

Messages over post and short lines in the Departments of the East, California, and Dakota, over which no charge is made, are omitted as comparatively unimportant.

There have been collected for the transmission of commercial telegrams over the military lines tariffs amounting to \$2,213.07. This amount has been deposited in the Treasury of the United States as required by law. In addition there has been collected and transferred to commercial companies the sum of \$3,450.65, covering tariffs for messages transmitted by such companies over their lines. Unfortunately the sum of \$25.01 of commercial tariffs was embezzled by two deserters.

The following lines, aggregating 254 miles, were abandoned or transferred during the year:

	Miles.
Fort Grant, Ariz., to Fort Apache, Ariz. (to Interior Department).....	145
Fort Yates, N. Dak., to Bismarck, N. Dak. (to Interior Department).....	60
Mammoth Springs, Ariz., to Hellner's ranch, Arizona (to Interior Department).....	34
Fort Washakie, Wyo., to Lander, Wyo. (abandoned).....	15

It is thought that one or two of the short lines can be abandoned the coming year without detriment to the interests of the Army.

FIRE-CONTROL SYSTEM FOR SEACOAST ARTILLERY.

In fire-control operations the utmost harmony and thorough cooperation have obtained throughout the year between this office, the Chief of Artillery, the Chief of Engineers, and the Chief of Ordnance. The appropriations are spent in accordance with the views of the Chief of Artillery, whose wishes have always been followed.

It is recognized that the Corps of Artillery is the dominant factor in the operation of our seacoast defenses, and that the system of fire control must be such as to commend itself to the far greater majority of the officers of the Artillery Corps. In this connection, however, the Chief Signal Officer reiterates his opinion that in addition to being a thoroughly reliable system, it should be as simple as possible, so as to be capable of satisfactory operation by the enlisted men of the Artillery Corps.

The Signal Corps, while not charged with problems of designs for artillery instruments, takes up the problem of electrical installation for the fire-control system of posts in such manner as the Chief of Artillery deems most promising in practical results. This is done either on plans and specifications drawn by the artillery, or the problem is worked out independently on indications as to the ends desired. In the former case the Signal Corps is not of course responsible for the efficient working of the system, only being expected to deliver instruments of first-class workmanship and material, conformable to the sample furnished or the specifications filed.

The Chief of Artillery and, indeed, most of the officers of the Artillery Corps charged with the important fire-control work take broad views of the situation. Almost invariably they simply enunciate the kind and character of work to be done and leave the solution of the electrical problems to the Signal Corps. Such methods should produce results more satisfactory and speedy than could otherwise be obtained.

While the Chief Signal Officer of the Army in considering fire-control matters has consistently sought the advice of expert officers, yet the burden of the work has fallen upon Maj. Edgar Russel, whose valuable experiences of seven years as an officer of artillery make him especially competent to recognize the needs of that service and to readily apply his theoretical knowledge of electricity to novel and important operations. Major Russel formulated specifications, made tests, and prepared instructions for the use of the various instruments and material, of which the most important are the armored cables, master clocks, service telephones, and telautographs. These have formed the basis of the general instructions for signal fire-control installation for the Army.

The electrical installation of the coast defenses of the United States will cost eventually in the neighborhood of \$3,000,000, and when com-

pleted its annual maintenance must cost \$300,000, calculating the deterioration of the electrical plant at 10 per cent. Unless properly cared for, telautographs, master clocks, telephones, switches, and batteries deteriorate very rapidly, and proper supervision of these expensive and elaborate electrical plants would prevent an otherwise enormous waste in the coming years. At present the Signal Corps neither supervises nor inspects these installations, which become part of the artillery plant as soon as constructed and transferred.

During the past year, in addition to the maintenance of existing installations, there has been installed a modern fire-control system in the Portland artillery district, and work commenced in the districts of northern New York and of the Chesapeake.

The work in the Portland district was done under very great difficulties, with limitations as to time, means, and working force.

The installation of this system was hampered by tremendous pressure because of insufficient time; by serious delays in transportation not under control of the Signal Corps; with the Artillery Corps improvising devices for the scheme while in progress; by conflicting classes of work under way by other bureaus; and by the troops carrying on preliminary drill. In addition, the 400 miles, on a single-conductor basis, of necessary cable could not be obtained from any American corporation in the limited time, and the artillery cable proffered to the Signal Corps proved entirely worthless. However, these developments were of public service, as indicating the advisability of suitable reserves of cable in time of peace and also the necessity of properly caring for cables when once purchased.

Additionally, time did not permit conformity to established scientific principles, for while no corporation of standing would install a complicated electrical system costing \$100,000 without testing it as a whole, and being perfectly satisfied with the installation before turning it over, yet in the Portland artillery district the Signal Corps never had an opportunity of testing its system as a whole, but was obliged to turn it over piecemeal as the various parts were finished. However, the submarine-telegraph system of the Signal Corps operated uninterruptedly during the maneuvers, and the telegraph and other instruments, though used by inexperienced parties without preliminary drill, were generally satisfactory. That such a complicated, inter-related fire-control system, installed by four different bureaus and corps of the Army, should have worked without preliminary drill and instruction is a test of the intelligence of the American soldier, man and officer; but such method, dangerous in time of war, is expensive in time of peace and should not be repeated.

Great expense, associated with impaired efficiency, marked the lack of standard systems for fire-control installations in the past. Such conditions are inseparable from the evolutionary stages of this novel service, indispensable to the coast defense, in which are involved most difficult electrical problems. The wise action of the Chief of Artillery, supported by the Chief of Staff, in the direction of standardization must have important results in the way of perfecting the system and ultimately in reducing the cost of annual maintenance. Signal corps experiments are being prosecuted, under supervision of artillery officers, to determine the comparative effectiveness of telautographs, telephones, printing and dial telegraphs, etc., as means of transmitting fire-control data, indispensable to successful target practice. While

the Signal Corps has succeeded in very materially strengthening the telautograph, yet the Chief Signal Officer of the Army believes that ultimately there should and will be adopted by the Artillery Corps the simplest possible means, probably the telephone and the telegraph. Experiments are now in progress with the hope of obtaining a printing telegraph inexpensive, simple, and reliable.

The principle obtains that in this, and in all other matters of harbor defense, the best and most efficient equipment should be secured so as to insure the integrity of American coasts in time of war.

ELECTRICAL FIRE-CONTROL STAFF.

The great extent of fire-control work necessitated the organization of an electrical fire-control staff, composed of electrical engineers and other expert assistants, who are assigned to different departments or stations as the exigencies of the service may demand. At present the body, under Electrical Engineer R. A. Klock, is stationed in Washington, and, under the supervision of First Lieut. W. A. Covington, the officer in charge of the electrical division, supervises the general work of the Signal Corps.

In the Department of the East Electrical Engineer Townsend Wolcott, with several assistants, has been charged with the very important work of inspecting the Alaskan cable and the fire-control work proceeding at various points in that department. Electrical engineers are also on duty in the Department of the Gulf, the Department of California, and on the cableship *Burnside*.

These employees have been obtained after competitive examination and certification from the United States Civil Service Commission, and have, almost without exception, been most satisfactory in their conduct and work. Several of them are men of unusual professional ability, and have shown resourcefulness and tact in their somewhat difficult work.

ESTIMATES AND EXPENDITURES.

The estimates of the Signal Office for the fiscal year ended June 30, 1906, are divided into two parts: One covering the Signal Corps proper, relates to the army bill, and the other, pertaining to fire-control installations for coast defenses, relates to the fortification bill.

Estimates for the coming fiscal year will be confined to the smallest amount consistent with an efficient administration. Expenditures on account of Alaskan cable work will be materially reduced. The great advances made in construction in the permanent defenses of the country entail considerable expenditures in electrical fire-control installation, indispensable to efficient defense. Estimates for these purposes include, first, emplacements already constructed and, second, emplacements to be constructed in the next fiscal year.

LOUISIANA PURCHASE EXPOSITION.

The exhibit at this exposition is under charge of Lieut. Col. George P. Scriven, Signal Corps. Its scope is comprehensive, covering all phases of signal corps work except ballooning. It includes signal and international flags, acetylene lanterns, and heliographs for visual

signaling; standard field outfits for telegraphic and telephonic work; buzzers and wireless sets for field operations; standard instruments and material relating to submarine cables and cable offices, and samples of the more important electrical instruments used in fire-control installations.

The exhibit is supplemented by a collection of photographic enlargements which illustrate war scenes connected with active operations in the Philippines, and by topographic relief maps which show lines of cables and telegraphs constructed by the Signal Corps for military purposes in Alaska, China, Cuba, the Philippines, and Porto Rico.

SIGNAL CORPS OF THE NATIONAL GUARD.

The importance of military communications has been very generally recognized by the organized militia of the United States. There exists, as shown by the last militia report of the War Department, signal corps organizations with commissioned officers and enlisted men in the States of California, Colorado, Connecticut, Illinois, Indiana, Iowa, Louisiana, Maine, Massachusetts, Nebraska, New Jersey, New York, Rhode Island, Texas, Utah, Washington, West Virginia, and the Territory of Oklahoma and the District of Columbia. Detachments under noncommissioned officers have also been organized in Maryland, New Hampshire, and Rhode Island, and in the Territory of Arizona.

The relations of the Signal Corps of the Army with the signal organizations of the National Guard of the States have been cordial and harmonious.

The Chief Signal Officer of the Army has had pleasure in giving definite information not only regarding the character of duties imposed at various times upon the Signal Corps, but also as to the extent and kind of equipment necessary for efficient work in any particular direction, such as visual signaling by day, visual signaling by night, telephone-exchange service, telegraphic work, etc.

TELEGRAPH AND CIPHER BUREAU OF THE WHITE HOUSE.

The telegraph and cipher bureau of the White House, which places the Commander in Chief of the Army and Navy in quick and direct communication with military forces on land and sea, has continued under the efficient supervision of Maj. Benjamin F. Montgomery, captain, Signal Corps, whose war services have been recognized by Congress in giving him advanced rank while so serving.

ARMY AND NAVY MANEUVERS.

While there have been no maneuvers of the Army and Navy during the present year, yet such measures have been taken by the Signal Corps as will render possible the establishment, in connection with future joint maneuvers, of standard fire-control communications within two months after any completed emplacement is placed at the disposal of this Bureau. In cases, however, where plans are changed, or when continuous work is prevented by drills or construction, fire-control installations will necessarily involve longer time and greater expense.

MILITARY MANEUVERS.

In the field instructions of the Army in maneuvers held in the Department of the Columbia, the Department of California, and the Atlantic Division, signal corps duties were in charge of Lieut. Col. Richard E. Thompson, Signal Corps; Maj. George O. Squier, Signal Corps, and Capt. Daniel J. Carr, Signal Corps, respectively.

Probably no part of the Army derived greater benefit from these maneuvers than did the Signal Corps, as in these encampments varying conditions obtained and different problems were put, the solution of which could not fail to be of great benefit.

Although no reports have been received therefrom, the material furnished was such that camp and intercamp telegraph and telephone communication should have been satisfactory. Through the lack of thoroughly trained officers and men it is doubtful whether the field electrical communications rise to that standard which the Chief Signal Officer of the Army has set for the corps. As the maneuvers offer opportunities for experimental work, there were tested several varieties of outpost wire and other experimental methods now under consideration.

The force was in each case insufficient, as experience has demonstrated the impossibility of providing entirely satisfactory field communications for an army corps with less than 2 per cent of the entire strength. In none of the above maneuvers did the Signal Corps have a force of 1 per cent to install and maintain its telegraph and telephone offices. Any defects that may have been noted are largely remediable by the employment of an adequate force.

COAST SIGNAL STATIONS.

It is a matter of the utmost importance that signaling apparatus of suitable character be installed at the more important of the artillery defenses along the Atlantic and Pacific coasts, so that it may be possible for intercommunication to take place between the Army and the Navy. At present there are no suitable means of communication. It is believed that speedy action is advisable in order to insure that efficiency and extended cooperation between the Army and the Navy of the United States which, so advisable for practice and maneuvers in time of peace, might be essential to the safety of the Union at a critical period in time of war. Estimates to the end in view are submitted, in connection with fire-control installations, to the Secretary of War for his consideration.

CABLESHIPS.

The extensive application of electricity to warfare has necessarily enlarged the scope of mechanical operations, as regards the establishment of plants and their annual maintenance. This is illustrated by the construction of three special ships for the use of the Artillery Corps in laying and recovering torpedo cables.

The Chief Signal Officer of the Army has, however, endeavored to minimize the expenses in connection with signal corps cables by utilizing, as far as possible, the transports of the Quartermaster's Department, making such modifications only as are essential to efficient cable work, without markedly impairing their value as transports.

The Quartermaster-General has cordially cooperated with the Chief Signal Officer of the Army in these matters, and the *Burnside* has been utilized in the Philippines and Alaska, both as a transport and as a cableship. The results of outfitting the *Burnside* illustrate the economy of such methods, and also obviated the humiliating as well as unreliable plan of repairing military cables by chartered ships flying foreign flags.

The *Burnside* demonstrated her thorough efficiency as a cableship by her operations the present summer in picking up and laying cables in depths ranging from 1 to 2 miles. The skillful manner in which she has been handled by Colonel Allen and Major Russel has been facilitated by the efficient service of Capt. Charles de F. Chandler, who, as quartermaster and cable officer of the transport, has been for the greater part of three years on cable duty.

In 1902 the Secretary of War, recognizing the very great importance of the Philippine cable service, and the advisability of its maintenance in a high degree of efficiency, directed, of his own motion, that a cableship be fitted up for Philippine work, leaving the *Burnside* to care for the installation and maintenance of the Alaskan cables. This action was eminently wise; but for reasons not officially known to the Chief Signal Officer of the Army, such ship was never equipped. As stated elsewhere, the cable service in the Philippines has suffered extensive interruptions, to the detriment of the public service and not to the credit of the Army. The recommendations for substitute methods advanced by the authorities in the Philippines utterly failed in their application, and as a last resort the *Burnside* was returned last winter to the Philippine Islands to do work that should have been done by a smaller and less expensive ship. Her necessary delay in the Philippines must be regretted, for cable repairs in the archipelago interfered with her Alaskan work, and very nearly threw its completion over to the summer of 1905.

Moreover, the *Burnside* had scarcely reached the United States when the Jolo-Zamboango cable was interrupted, and has since remained in that condition, cutting off Jolo telegraphically from Manila. The situation was placed before the Chief of Staff and the Secretary of War with the recommendation that cable service be either abandoned or that it be maintained as a reliable and efficient service. The Secretary of War directed that hereafter the cable and telegraph systems of the Philippine Islands should be maintained in a high degree of efficiency, and instructions were given for the outfitting of a smaller transport, which, serving as a transport under ordinary circumstances, could be utilized in repair work when cable interruptions occurred. The cable, engineer, and apparatus have long since been provided, but the question of a ship is still under consideration.

The necessity of prompt action along the lines recommended by the Chief Signal Officer of the Army has been emphasized by the interruption to the Dumaguete-Misamis cable in September, which further restricts communication by cutting off all communication with Mindanao, except the port of Surigao.

For several years the repair of signal corps cables along the Atlantic coast has depended upon the utilization of the Western Union cable boat in important cases and of temporary makeshifts in others. Despite every effort, cables in connection with the most important defenses of the United States have been interrupted for prolonged

periods, owing to the inability to secure a suitable boat by charter. This year, however, the Quartermaster-General has purchased a boat, christened the *Cyrus W. Field*, which is to be used by the Signal Corps of the Army in the maintenance and installation of military cables along the Atlantic and Gulf coasts. The *Field* is fitted up in the plainest possible manner in general, but is supplied with such cable apparatus as will make her an efficient and satisfactory cable boat. Outfitted under the supervision of Capt. B. O. Lenoir, Signal Corps, who has had extended cable experience, it is believed that she will render efficient and economical service in the years to come.

INTERNATIONAL TELEGRAPH CONFERENCE.

Although the United States is not an adhering party to the International Telegraph Union, yet the Government of Great Britain invited this country to be represented at the International Telegraph Conference held in London from May 27 to July 3, 1903. On the recommendation of the Secretary of War and by the appointment of the Secretary of State, the Chief Signal Officer of the Army represented the interests of the United States. The conditions were somewhat difficult owing to the fact that the Chief Signal Officer as a delegate from this country had no vote, his participation being with the distinct understanding that the United States incurred no obligations thereby. The United States was represented at this convention owing to the alarm felt by the commercial and industrial interests of this country regarding the proposed adoption of an official vocabulary whence all code words should be drawn. If this vocabulary had been adopted it would have necessitated the reconstruction of practically every private telegraph code in the United States, to the great detriment of commercial interests.

No opportunities were lost to determine the attitude of the official delegates and to urge on them the inadvisability of an obligatory vocabulary. The representatives of Great Britain were heartily in accord with American views, and to their assiduity and ability are largely due the successful issues. Not only was the obligatory vocabulary withdrawn, but the regulations regarding cipher messages and code words have been so extended as to meet all demands of American interests.

It is most strongly urged that steps be taken by the United States to adhere to the International Telegraph Union. American interests will be threatened in future conventions, and without a vote the time may come when results detrimental to this country must ensue unless the United States participates therein.

As compared with the contracting States, the United States is now at a disadvantage in the use of foreign cables and land lines. In time of war the United States has to yield priority to the official messages of all contracting States, as under the regulations such telegrams take precedence.

The International Telegraph Union furnishes the contracting States gratuitously all information relative to international telegraphy, such as interruptions, restorations, etc., and the United States has for years obtained such valuable information secondhand and as a favor, if at all. The expense of the maintenance of the International Bureau is borne by the different States, and would probably not exceed a few hundred dollars per year for the United States. The amount could be

paid from the telegraphic appropriations of the Signal Corps if authority be given, or the expense could be met, as in other countries, by the additional charge of one cent on each message over the United States lines, as is now done in the Philippines.

INTERNATIONAL WIRELESS CONFERENCE.

The Chief Signal Officer of the Army attended as an official delegate of the United States the preliminary international conference for the regulation of wireless telegraphy, which was held in Berlin, Germany, from August 4 to 15, 1903. The conference regarded wireless telegraphy as an enlargement of ordinary telegraphy. The regulations suggested look to the application to wireless telegraph companies of the same rules of obligation and liability as now apply to ordinary telegraph and cable companies. These views are in harmony with the decisions of the Supreme Court of the United States that telegraph companies are common carriers.

The complications that have arisen regarding wireless telegraphy in the Russo-Japanese war clearly indicate the great necessity of international regulations regarding this method of communication. The importance of the Army being represented at the International Wireless Conference, to meet in Berlin the coming winter, has already been recognized.

WIRELESS TELEGRAPHY OF ARMY AND NAVY.

The question of wireless telegraphy in the service of the United States was considered by a board appointed by the President, of which the Chief Signal Officer of the Army was a member. The unanimous recommendations of this board were approved by the President under date of July 29, 1904. This board, after recognizing the able and persistent work of the Signal Corps of the Army in advancing the science of wireless telegraphy, formulates its unrestricted use by the Army for military purposes as follows:

Its use by the Signal Corps of the Army for communication between military posts of the Army and other necessary links will be necessary both in peace and war, and that such use shall be unrestricted.

When interference seems probable between stations of the Navy and War Departments, the question involved shall be mutually settled by representatives of the two Departments.

That the best results can be obtained from stations under the jurisdiction of one Department of the Government only, and that representatives of more than one Department shall not be quartered at any station.

That the Signal Corps of the Army be authorized, under its Chief, to establish from time to time such wireless stations as may be deemed necessary, and that they do not interfere with the coastwise wireless-telegraph system of the Government under control of the Navy Department.

And further, that the Chief Signal Officer be requested to inform the Navy Department what stations of its system may be utilized to transmit messages for the Signal Corps or other bureaus of the War Department, and that representatives of the Signal Corps of the Army and the Bureau of Equipment of the Navy Department be at once requested to draw up such rules as will insure the efficient and harmonious carrying into effect of the above recommendations.

That the Navy Department be directed to receive from the Signal Corps of the Army, at such points as may be requested by the Chief Signal Officer of the Army, all messages for army posts within their radii and transmit them, under such rules as may be agreed upon by the representatives of the Signal Corps and Bureau of Equipment, without cost to the Signal Corps of the Army.

The harmonious action and unanimous recommendations of the Board, while preserving to the Army unrestricted use of wireless

telegraphy for all military uses, insure a hearty and desirable cooperation between the Army and Navy. It is to be noted that there is also secured to the Army free and full use of naval wireless stations for the reception and transmission of military messages.

The action taken to provide the Army with the most efficient means of wireless communications is separately considered.

SIGNAL CORPS WIRELESS SYSTEM.

In 1899 the Signal Corps devised a system of wireless telegraphy, the first publicly operated in America. Improved in details, it works successfully over the limited ranges between harbor fortification, for which it was planned. Recognizing, however, the rapid advances sure to be made by the many experts in civil pursuits, the Chief Signal Officer decided to adhere in this matter to his general policy, which looks to experimental work by the Signal Corps only under conditions where recourse can not be had advantageously to the great commercial and industrial establishments of the United States.

Owing to the repeated failures of several wireless telegraph companies to furnish a reliable and satisfactory system of wireless telegraphy in Alaska over a distance of 100 miles, the Chief Signal Officer decided in 1903 to have all existing systems examined with reference to their practical qualities. He decided to obtain by elimination, substitution, or invention some system for army use which would embody qualities necessary for the reliable and successful transmission of messages.

The previsionary methods of the Chief Signal Officer had already accumulated information and instruments which facilitated the solution of the problem. In addition to the systematic collection of all published data on wireless telegraphy, no efforts had been spared to supplement these by information through conference and correspondence with inventors and investigators. There were also purchased sample instruments and installations pertaining to every system that seemed worthy of test, and where a title to the instrument could be obtained for a reasonable compensation. In this way there were acquired essential parts of important systems. Experimental work in wireless telegraphy had also been done by Majrs. Samuel Reber, George O. Squier, and Edgar Russel, all of the Signal Corps, but none of these officers were available for assignment to the work, which demanded the entire attention of the officer charged therewith.

For experimental work in connection with the perfecting of a permanent plant, Capt. Leonard D. Wildman, Signal Corps, a graduate of Stevens Institute of Technology, who had displayed resourcefulness and persistency in various phases of field duty, was selected. With full authority to call on Major Reber and Captain Russel for advice, the accumulated data and instruments were turned over to Captain Wildman, who began his work by tests as to the capacity and efficiency of the Braun-Halske field wireless train, a duplicate of the plant operated successfully during the German maneuvers. While the results from this train were not unsuccessful, its maximum capacity for transmission of messages over 63 miles was not entirely satisfactory.

In addition to determining the type of field wireless apparatus best suited to the American Army, he was particularly charged with the composition and installation of a wireless plant of the permanent type, which should, by practical operations, demonstrate its capacity for successful work at distances exceeding 100 miles.

The field of operation was between Fort Wright, Fisher Island, and Fort Schuyler, N. Y., the stations being 97 miles apart, of which 20 miles was across land. The use of these forts is a factor in the national defense, as it establishes a wireless system by which, in times of great disturbance, messages can be more quickly exchanged between the outlying defenses of New York than by commercial system.

With these ends in view, experiments were carried on under Captain Wildman's personal supervision during the past year with instruments purchased from the Lodge-Muirhead Wireless Telegraph Company (Limited), of Great Britain; the Braun-Siemens-Halske Wireless Telegraph Company, of Germany; the National Electric Signaling Company, of Washington, and from the De Forest Wireless Telegraph Company, of New York.

Experimental apparatus were purchased by the Chief Signal Officer from time to time in addition to the instruments furnished by companies and individuals. Comparative tests were also made with all obtainable receivers, responders, and coherers on the market, as well as with many different types of special appliances, particularly those of the Stone-Stone system.

Notwithstanding the popular idea that wireless telegraphy over great distances is an accomplished commercial fact, none of the systems investigated proved satisfactory for army use. Wireless telegraph systems seem to have been developed by their inventors rather from the electrical than from the mechanical side, and as a consequent result laboratory and experimental makeshifts have been placed upon the market as commercial instruments.

After an investigation of existing available systems, Captain Wildman formulated, with the approval of the Chief Signal Officer, the following changes as being necessary for practical military uses:

1. Eliminate the necessity for an absolute electrical ground.
2. Construct all parts of the apparatus so that in case of the destruction of any part from whatever cause, that part can be replaced without elaborate machinery and by intelligent unskilled labor.
3. Replace all adjustments which require a knowledge of mathematics, or experience in manipulation, by lettered dials or definite switch positions, so that highly skilled operators shall be unnecessary.
4. Reduce the necessary height of the aerial wires.
5. Produce a receiver which will not only receive the message intended for it, but which can by adjustment also receive any electro-magnetic wave.
6. Eliminate wholly or largely disturbances due to atmospheric or static electricity.
7. Avoid as far as practicable all dangerous high-potential currents at points where there is possibility of danger to employees.
8. Provide appliances and devices which will protect the instruments and machinery from destructive potentials from whatever cause.
9. Avoid as far as possible the use of patented devices and the consequent payment of large royalties.
10. Devise a system which can be easily transported in time of war and which is capable of transmitting messages under all climatic and topographical conditions.

Extended tests were made of the De Forest system, which in its original and earlier forms has been successfully operated during the Army and Navy maneuvers of 1902 in Long Island Sound, where the Signal Corps applied wireless telegraphy to military purposes, its first installation therefor in America.

The De Forest system barely covered the Schuyler-Wright course, its manifestations being under the most favorable condition like to the ghost of a sound, while it was impracticable during the active opera-

tion of adjacent and disturbing stations. Undismayed by the situation, Captain Wildman so applied himself with judgment and assiduity to the problem of supplementing and improving it that he succeeded in solving the problem as far as the needs of the Signal Corps are concerned. His improvements were formulated and patented equally in the interests of the United States, to whom the patents are assigned, and of the inventor.

Although the signal corps (or Wildman) system at present is not perfect in some of the qualities desired, it is better than any system previously tried. It is not absolutely unbreakable; it can not be operated by men of a low order of intelligence; it is not absolutely safe to handle; the aerial wires have not been entirely eliminated; it is not entirely free from interference from stations close at hand; nor can it be operated during a heavy thunderstorm.

On the other hand, a substitute for a good electrical ground has been found; the operation and adjustments are simple; there is only one place within the reach of an operator where there is a destructive potential; the height of the aerial antennæ has been much lessened, and the apparatus durable and easily repaired. Messages were daily sent in great numbers ninety-seven miles for five weeks without any apparent deterioration in apparatus or machinery.

These experiments have furnished a large amount of accurate and valuable data on the subject of poles and their setting, antennæ and their rigging, houses and their construction, dynamos and their design, transformers and their durability, induction coils and their action, and the various methods of tuning the antennæ to each other and to the closed oscillating circuits by which they are fed.

With the exception of the De Forest receiver, an invention in litigation, the signal corps system has no patented or patentable devices other than those invented and designed by the officers and enlisted men of the Signal Corps which can speak over one hundred miles independent of the De Forest devices.

It is recognized that the public in general has been put into a state of unbelief by the extravagant and unmaterialized claims of wireless telegraph experimenters and inventors. Experience alone will prove whether the devices adopted in the signal corps system are open to unforeseen objections when transferred from a temperate climate and favorable conditions to places where their operation and maintenance must be by unskilled labor and in an unfavorable environment.

It appears certain, however, that for army uses this system is better than anything heretofore upon the market. If time should disprove the utility of some of the features which now seem promising and these instruments ultimately disclose faults in design or construction, such phases mark all inventions. At any event, this is an advance over systems in use when these experiments were initiated.

Captain Wildman acknowledges his indebtedness to Major Reber and Captain Russel for valuable advice and assistance. He also recognizes his intelligent and helpful assistants, enlisted and civilian.

Especial commendation is due Captain Wildman for the persistent and skillful manner in which he has contributed to the efficiency of the Army in perfecting the signal corps system of wireless telegraphy. Marked improvements in methods and valuable advancements in instrumental appliances have been the outcome of his methodical investigations and extended experience. The improvements are largely his

own devices, two patents obtained by him for wireless inventions have been assigned to the Government in order to protect the United States in their use. Nor should it be thought that the results are laboratory and theoretical only. The Long Island wireless plant, transferred to Alaska under Captain Wildman's supervision, now transmits commercial business, as stated elsewhere, reliably and rapidly, a distance of 107 miles across Norton Sound.

In simplicity, durability, safety, and reliability the signal corps system is thought to be superior for army use to any other.

AUTOMOBILES.

The evident value of auto-propelled vehicles as parts of telegraph and balloon trains has led the Chief Signal Officer of the Army to continue experiments with automobiles. While automobilism in its present state is evidently unsuited for general transportation in the field, yet the experiences of the Signal Corps have demonstrated the practicability and advisability of self-propelled vehicles for special military purposes; and it may be added that experiments in foreign armies likewise confirm this opinion.

While the good points of electric and steam vehicles are thoroughly recognized, yet the internal-combustion type, using kerosene or other oil, seems better suited for war purposes. This type has especially valuable features from a military standpoint in its small fuel and water consumption, essential qualities for reliable service in field operations.

BALLOONING.

It has been impossible to do any ballooning work during the past year, as there were neither men nor officers available for this duty. Repeated applications to scores of American manufacturers disclosed the inability of the Signal Corps to purchase compressed hydrogen gas, which is absolutely necessary for rapid and successful aeronautical work with captive balloons. A permanent plant for making and compressing hydrogen gas is therefore necessary. Active steps in this direction will be taken as soon as Omaha Barracks is put in condition for signal corps work, as recommended by the Chief of Staff and approved by the Secretary of War.

WAR DEPARTMENT TELEGRAPHIC CODE.

The increased telegraphic expenses of the War Department in late years make the War Department telegraphic code economically important. The preparation of this code has devolved upon the Chief Signal Officer personally, as there was no other available officer having combined knowledge of telegraphy, military usages, special vocabularies, and the commercial cable regulations of the world.

Specially prepared tables reduce the length of official messages to a minimum. In connection with certain classes of business a single word acknowledges the messages and conveys to the sender the action taken thereon. On an average each cipher word represents about seven words in plain text.

Primarily a code for economy, the War Department telegraphic code is also available for enciphering confidential messages. Each code word has a number, so that any method of enciphering by key numbers can be used.

The only addition during the present year has been Appendix No. 3, wherein every officer on the active list of the Army has been assigned a code word under which he is known in cipher or other important messages.

A much-needed general revision of the code is now under consideration. Steps have already been taken to utilize the extended privileges as to code words authorized by the International Telegraph Conference of 1903. It is planned to use only such code words as are free from characteristics that facilitate telegraphic errors in either the American or continental Morse alphabets.

ORGANIZATION OF THE SIGNAL CORPS.

The Signal Corps, by law, has an authorized strength of 1 brigadier-general, 1 colonel, 2 lieutenant-colonels, 6 majors, 18 captains, 18 first lieutenants, 36 master signal electricians, 132 first-class sergeants, 144 sergeants, 156 corporals, 552 first-class privates, 168 privates, and 24 cooks; in all, 46 officers and 1,212 enlisted men. There were on July 31, 1904, the date of the last complete return of the Corps, 14 officers detailed from the line of the Army. There then existed one vacancy among the first lieutenantcies, while the enlisted strength was 302 short of that authorized by law.

The corps has lost during the year by death Capt. Edward B. Ives, an officer of high character and professional ability, and by resignation First Lieut. Frank B. Lyman. The promotion of Col. Henry H. C. Dunwoody to be brigadier-general removes from further duty with the Corps an officer whose ability and standing are recognized by this unusual distinction.

The following officers belong to the Corps:

No.	Name and rank.	Stations and duties, July 31, 1904. (Foreign service since appointment as regular officer.)	At present station since—	Born.
<i>Chief Signal Officer, Brigadier-General.</i>				
1	ADOLPHUS W. GREELY	Washington, D. C. Foreign service (inspection duty in Alaska, Cuba, and the Philippines) one year and one month.	.....	Mar. 27, 1844
<i>Colonel.</i>				
1	James Allen	Signal officer, Department of the East, Army Building, New York, N. Y.; on temporary duty on transport Burnside, serving as cable ship for Signal Corps in Alaskan waters, in charge of the installation of the Alaskan cable system, since May 15, 1904. Duty in Cuba and Cuban waters, May 29 to July 21, 1898; in Porto Rico, July 26 to September 1, 1898; in the Philippines, December 19, 1899, to March 12, 1902; in Alaska, September 16 to October 20, 1903, and June 19 to July 17, 1904.	Dec. 8, 1903	Feb. 13, 1849
<i>Lieutenant-colonels.</i>				
1	Richard E. Thompson	Signal officer, Department of the Columbia, Vancouver Barracks, Wash. Duty in the Philippines, July 25, 1898, to December 29, 1899.	Aug. 10, 1903	Jan. 18, 1846
2	George P. Scriven	Office Chief Signal Officer, Washington, D. C.; on detached service in charge of Signal Corps Exhibit at the Louisiana Purchase Exposition; on two months' leave of absence per paragraph 6, Special Orders, No. 116, War Department, May 17, 1904.	June 27, 1901	Feb. 21, 1854

No.	Name and rank.	Stations and duties, July 31, 1904. (Foreign service since appointment as regular officer.)	At present station since—	Born.
<i>Lieutenant-colonels—Cont'd.</i>				
2	George P. Scriven	Duty in the Philippines, August 21 to September 2, 1898; November 23, 1899, to July 17, 1900, and December 9, 1900, to May 22, 1901; in Cuba, February 6 to August 5, 1899; in China, August 2 to November 25, 1900.		
<i>Majors.</i>				
1	William A. Glassford	Signal officer, Department of the Gulf, Atlanta, Ga. Duty in Porto Rico, July 31, 1898, to January 22, 1901; in Alaska, August 18 to December 7, 1901; in the Philippines, February 17, 1902, to January 13, 1904.	Apr. 13, 1904	Apr. 11, 1863
2	Joseph E. Maxfield	Signal officer, Philippines Division, Manila, P. I. Duty in Cuba, June 22 to July 20, 1898, and December 16, 1898, to January 14, 1899; in the Philippines, June 26, 1899, to July 1, 1900; in Alaska, May 27, to August 18, 1902.	Dec. 28, 1903	Apr. 3, 1860
3	Frank Greene	Signal officer, Department of Luzon, Manila, P. I.; on two months' leave of absence per paragraph 14, Special Orders, No. 144, War Department, June 20, 1904. Duty in Cuba, June 22 to September 12, 1898; in Alaska, August 2, 1900, to July 14, 1902; in the Philippines; September 26, 1902, to March 15, 1904.	Oct. 2, 1902	Mar. 16, 1849
4	Samuel Reber	Washington, D. C.; on duty with War Department General Staff. Duty in Porto Rico, July 25 to September 13, 1898; in Cuba January 6, to October 1, 1899.	Aug. 15, 1903	Oct. 16, 1864
5	George O. Squier	Signal officer, Department of California, San Francisco, Cal.; on six months' leave of absence since March 1, 1904, per paragraph 7, Special Orders, No. 42, War Department, February 19, 1904. Duty in the Philippines, December 6, 1900, to June 14, 1903; on leave from the Philippines, May 17 to September 1, 1902.	July 10, 1903	Mar. 21, 1865
6	Edgar Russel	Office Chief Signal Officer, Washington, D. C.; on detached service on transport Burnside serving as cable-ship for Signal Corps in Alaskan waters, duty pertaining to the installation of the Alaskan cable, since May 1, 1904. Duty in the Philippines, August 24, 1898, to April 22, 1901; in Alaska July 10 to October 20, 1903, and June 19 to July 17, 1904.	Jan. 4, 1904	Feb. 20, 1862
<i>Chief of the Telegraph and Cipher Bureau of the Executive Office, with the rank of major.</i>				
	Benjamin F. Montgomery	On duty at the White House, Washington, D. C.	Apr. 24, 1901	July 5, 1853
<i>Captains.</i>				
1	Eugene O. Fechté	Commanding officer, Benicia Barracks, Cal. Duty in the Philippines, October 17, 1901, to December 15, 1903.	July 1, 1904	Mar. 14, 1846
2	Charles McK. Saltzman	Signal officer, Department of Mindanao, Zamboanga, P. I. Duty in Cuba, June 24 to July 6, 1898; in the Philippines since March 21, 1902.	Feb. 20, 1903	Oct. 18, 1871
3	Benjamin F. Montgomery	(Serving as Chief of the Telegraph and Cipher Bureau of the Executive Office, with the rank of major.)	Apr. 24, 1901	July 5, 1853
4	Daniel J. Carr	Assistant to Chief Signal Officer, Washington, D. C.	Mar. 15, 1902	Nov. 25, 1860

No.	Name and rank.	Stations and duties, July 31, 1904. (Foreign service since appointments as regular officer.)	At present station since—	Born.
<i>Captains—Continued.</i>				
5	Carl F. Hartman	Benicia Barracks, Cal. Duty in the Philippines, May 26, 1901, to December 15, 1903; on leave from the Philippines, October 8, 1902, to January 31, 1903.	Feb. 2, 1904	Jan. 17, 1868
6	George C. Burnell	Commanding officer, Fort Wood, N. Y.; on duty as acting signal officer, Department of the East, Army building, New York, N. Y., during absence of Col. James Allen, since May 15, 1904. Duty in Alaska, June 24, 1901, to October 20, 1903.	Feb. 25, 1904	July 5, 1868
7	Leonard D. Wildman	Nome, Alaska. Duty in the Philippines, May 9, 1901, to October 1, 1902.	July 26, 1904	Oct. 13, 1868
8	Charles B. Hepburn	Benicia Barracks, Cal.	July 20, 1904	Aug. 14, 1868
9	Otto A. Nesmith	Fort Egbert, Alaska. Duty in Cuba, May 17, 1901, to May 20, 1902.	July 10, 1903	Mar. 7, 1852
10	Walter L. Clarke	Temporarily signal officer, Department of Luzon, Manila, P. I. Duty in the Philippines, May 9, 1901, to April 22, 1902; in Alaska, September 27, to October 9, 1902.	Feb. 5, 1904	Mar. 10, 1863
11	Basil O. Lenoir	Assistant to the signal officer, Department of the East, Army Building, New York, N. Y. Duty in the Philippines, May 8, 1901, to August 8, 1902.	Dec. 8, 1903	Nov. 12, 1858
12	William Mitchell	Commanding Signal Corps Post, Fort Myer, Va. Duty in Alaska, November 10, 1901, to July 27, 1903.	July 16, 1904	Dec. 29, 1879
13	Henry W. Stamford	Cebu, Cebu, P. I. Duty in China, April 27 to May 27, 1901; in the Philippines, June 5 to September 2, 1901, and since March 1, 1904.	May 31, 1904	Mar. 19, 1866
14	Charles S. Wallace	Seattle, Wash.; on duty on transport Burnside, serving as cables ship for Signal Corps in Alaskan waters, pertaining to the installation of the Alaskan cable. Duty in the Philippines, May 24, 1901, to November 3, 1903; in Alaska, June 19 to July 17, 1904.	May 6, 1904	Sept. 11, 1866
15	George S. Gibbs	Disbursing officer, Signal Corps, Washington, D. C. Duty in Alaska, July 6, 1901, to July 25, 1903.	Feb. 19, 1904	Dec. 14, 1875
16	Charles DeF. Chandler	Quartermaster and commissary on transport Burnside, serving as cables ship for Signal Corps. Duty in the Philippines since September 26, 1901, including eight months of detached service on Burnside in Alaskan waters.	May 20, 1903	Dec. 24, 1878
17	Henry S. Hathaway	Fort Wood, N. Y. Duty in the Philippines, May 9, 1901, to July 17, 1902.	May 5, 1904	July 6, 1872
18	Richard O. Rickard	Vancouver Barracks, Wash. Duty in the Philippines, May 26, 1901, to March 23, 1902; in Alaska, July 8, 1903, to July 22, 1904.	Aug. 2, 1904	July 15, 1874
<i>First lieutenants.</i>				
1	Herbert J. Brees ^a	Fort Wood, N. Y. Duty in the Philippines, October 4, 1900, to September 5, 1901.	Feb. 25, 1904	July 12, 1877
2	Joseph W. Beacham, jr. ^a ..	Manila, P. I. Duty in the Philippines, May 14, 1901, to February 16, 1902, and since December 28, 1903.	May 11, 1904	Apr. 8, 1878
3	William A. Kent ^a	Benicia Barracks, Cal. Duty in the Philippines, August 25, 1899, to September 29, 1901, and May 27, 1903, to June 15, 1904.	July 14, 1904	Nov. 22, 1874

^a First lieutenant, Signal Corps, by detail under act of Congress approved March 3, 1903.

No.	Name and rank.	Stations and duties, July 31, 1904. (Foreign service since appointment as regular officer.)	At present station since—	Born.
<i>First lieutenants—Cont'd.</i>				
4	Lawrence P. Butler ^a	Signal Corps Post, Fort Myer, Va..... Duty in the Philippines, June 12, 1901, to May 12, 1903.	May 17, 1904	Jan. 23, 1868
5	Mack K. Cunningham	Manila, P. I..... Duty in the Philippines since July 29, 1902.	June 29, 1904	Feb. 14, 1870
6	Alfred T. Clifton	Vancouver Barracks, Wash..... Duty in the Philippines, May 26 to September 16, 1901; in Alaska, September 16, 1903, to July 22, 1904.	Aug. 2, 1904	May 26, 1875
7	Otto B. Grimm	Disbursing officer, quartermaster, and commissary, Signal Corps, in Philippines Division, Manila, P. I. Duty in Alaska, July 1, 1901, to March 1, 1902; in the Philippines since July 4, 1902.	July 31, 1903	Nov. 30, 1873
8	William A. Covington ^a	Office Chief Signal Officer, Washington, D. C.	Apr. 18, 1904	June 7, 1873
9	Alvin C. Voris ^a	Signal Corps Post, Fort Myer, Va..... Duty in the Philippines May 12, 1902, to August 16, 1902.	Oct. 1, 1903	Jan. 5, 1876
10	George E. Kumpe ^a	Benicia Barracks, Cal..... Duty in the Philippines, December 22, 1901, to August 16, 1902, and October 2, 1903, to May 15, 1904.	June 17, 1904	May 12, 1876
11	Gordon Johnston ^a	Signal Corps Post, Fort Myer, Va..... Duty in Cuba, November 18, 1901, to April 24, 1902.	Nov. 30, 1903	May 25, 1874
12	E. Alexis Jeunet ^a	Office Chief Signal Officer, Washington, D. C. Duty in the Philippines, January 11, 1902, to September 14, 1902.	Apr. 18, 1904	Mar. 1, 1872
13	John E. Hemphill ^a	Nome, Alaska..... Duty in the Philippines, July 1, 1901, to July 11, 1902.	July 26, 1904	June 4, 1867
14	William M. Goodale ^a	Benicia Barracks, Cal..... Duty in the Philippines, November 18, 1901, to July 17, 1902.	Feb. 2, 1904	Jan. 19, 1872
15	Allan L. Briggs ^a	Signal Corps Post, Fort Myer, Va.....	Nov. 16, 1903	Feb. 14, 1873
16	James S. Butler ^a	Seattle, Wash..... Duty in Philippines, February 5 to April 6, 1904.	May 17, 1904	Nov. 19, 1877
17	William C. Fitzpatrick ^a	Fort Gibbon, Alaska..... Duty in Alaska, September 7, 1901, to July 24, 1902.	July 14, 1904	June 6, 1876
18	Vacancy.			

^a First Lieutenant, Signal Corps, by detail under act of Congress approved March 2, 1903.

While it is desirable that the commissioned force should be increased by 2 captains and 2 first lieutenants, whose services are now urgently needed, yet the Chief Signal Officer of the Army believes it very much more important that there should be added to the Signal Corps 1 colonel and 1 lieutenant-colonel. There are now but 9 field officers in the Signal Corps, as against 36 captains and first lieutenants, making the proportion of field officers but 22 per cent, the smallest proportion in any staff corps of the Army. Without such additions no less than 57 per cent, or 16 out of the 28 officers below the grade of colonel, can not expect promotion to that grade; 29 per cent will retire as majors, and 9 per cent will retire as captains. The majority of these unfortunate officers are those whose abilities, services, and character warrant their attaining a high grade. As matters now are, they are simply forbidden in the Signal Corps that promotion which would come to them in any other corps of the Army. It is submitted that in point of responsibility, of professional knowledge, and physical qualities the requirements for efficient field and office work do not compare as regards the Signal Corps unfavorably with those of other staff corps.

Important electrical work requires in commercial life ability of the highest character, which is correspondingly rewarded, and if efficient

service in time of war is expected from the Signal Corps the attainments and services of its officers should at least not be inferior to those of other corps.

The detail system is now in its second year of operation. The Chief Signal Officer has loyally struggled to make this service a success under the very difficult conditions in which he has been placed. Only one first lieutenant in the whole Army was willing to demonstrate his fitness for signal corps work by examination, and his approaching promotion prevented his detail. Only two lieutenants in the Army have applied for signal duty, and in neither case was favorable action deemed advisable. A system of conscription was resorted to, the Chief Signal Officer of the Army selecting double the number of candidates to that of existing vacancies, personally satisfying himself of the character, ability, and moral standing of the various officers.

From the list submitted to the Chief of Staff these officers were detailed without their knowledge. In this way have been obtained 14 officers whose services, with possibly one exception, have demonstrated their fidelity to duty. No less than 28 per cent of the number, however, endeavored to evade the service by personal or political influence after their detail, but the Chief of Staff and Secretary of War have supported the Chief Signal Officer in his assertion that these officers owed full allegiance and their best efforts to whatever service they might be assigned.

The Chief Signal Officer of the Army, while knowing the ability of these officers in the line of the Army, can not, however, fail to recognize that only a small percentage have the aptitude and predilection which contribute so much to the efficiency of officers when on satisfactory duty. Practically branded, as some of these officers have been, as deserters from the line to the Signal Corps, although in reality conscripts, the outlook is unfavorable for that success in rotation of duty for which the Chief Signal Officer earnestly labors.

It is believed that, while the detail service in many respects is valuable, in other ways it is not; in fact, it previously failed in the Signal Corps, where it was tried for twenty-five years.

It is urged that the same system which built up the efficiency of the Signal Corps, as demonstrated in the Spanish-American war, be recurred to. This involves the important principles of selection, competition, and elimination. These methods can be applied by retaining permanent grades in the Signal Corps from captaincies upward, and filling, as now, the grades of first lieutenants by detail; which is selection. When a detailed officer has demonstrated his lack of aptitude for signal duty, he should be relieved; which is elimination. Whenever a vacancy occurs in the permanent grade of captain, it should be filled from detailed officers whose services have been entirely satisfactory, and who present themselves as candidates for examination: this is competition.

For its present duties the enlisted force is sufficient, or will be when it is recruited to its authorized strength. It is, however, considered as of special importance that company organizations be authorized by law, as has been recommended both by the General Staff and by the Secretary of War. Such legislation would increase the solidarity of the Corps and contribute to its efficiency. Cooks are authorized by law, and provisional companies have been organized for administrative purposes and for field operations.

OFFICE OF THE CHIEF SIGNAL OFFICER.

The most approved methods of handling the immense volume of papers in the office of the Chief Signal Officer have been adopted, but the allotted clerical force is inadequate for handling with dispatch and efficiency the large amount of work devolving upon the Corps. Not only has the Signal Corps been increased within the past five years from a force of 10 officers and 50 men to 46 officers and 1,210 men, but the annual appropriations incident on extended work have been increased from \$18,000 to nearly \$1,000,000. The placing of the coast defenses in a proper state of efficiency necessarily involves a great amount of work connected with the electrical communications at the various artillery posts.

A reorganization of the Signal Office into five divisions has coordinated and harmonized current methods of conducting public business and increasing the amount of work possible for each clerk.

While it has been possible to devolve some of the extra clerical work on the electrical engineers, yet such course is undesirable and eventually more expensive to the United States.

The following clerical force is considered absolutely necessary for prompt and satisfactory transaction of public business:

One chief clerk	\$2, 250
One chief of disbursing division	2, 000
Three clerks, class 4	5, 400
Three clerks, class 3	4, 800
Four clerks, class 2	5, 600
Eight clerks, class 1	9, 600
Six clerks, at \$1,000	6, 000
Two clerks, at \$900	1, 800
One messenger	840
Two assistant messengers, at \$720	1, 440
One laborer	660

Almost without exception the employees in this office have performed their duties with intelligence, zeal, and fidelity; it is not believed that an equal number of men elsewhere in Government service have done as much work. It is impossible to obtain and keep stenographers for a monthly pay of \$60 and \$70—salaries paid to messengers and assistant messengers. The Signal Office has suffered injustice in this matter, which it is hoped will receive the attention of the Secretary of War and of Congress.

ADMINISTRATIVE DIVISION.

The administrative division has charge of the routine work of the Signal Office—the mail, general office correspondence, the office files, and all matters affecting the commissioned, enlisted, and civilian force of the Signal Corps. This division, with an inadequate clerical force, has by assiduity and system handled 261,902 letters and communications during the year. Lieut. Col. George P. Scriven, Capt. George S. Gibbs, and Capt. J. D. Carr have in turn most satisfactorily supervised the work of this division and the important duties of principal assistant to the Chief Signal Officer associated therewith.

DISBURSING DIVISION.

This division is charged with the preparation of estimates for appropriations by Congress; accounts, requisitions, and transfers from appropriations, quotations, samples, and advertisements, abstracting

bids, making awards, placing orders, inspection, shipment, invoicing and accounting of supplies, payment of accounts, collecting bills, and all other duties pertaining to disbursements. The duties of disbursing officer have been performed most efficiently and promptly by Capt. D. J. Carr, Signal Corps, who was relieved on June 15 by Capt. George S. Gibbs.

Captain Carr's report shows that in the regular inspection of his accounts no errors have been found during the year and no disallowances have been made by the Auditor for the War Department.

In urging a much needed increase in clerical force, the disbursing officer reports that his six clerks have handled 100,278 papers during the year. The work has been performed only by the unremitting attention of the clerks to duty.

The disbursements for the year, \$857,969.11, exceed those of any preceding year except one, and are greater than during the Spanish-American war.

The following table shows the state and disposition of appropriations aggregating \$1,302,396.33:

	Disbursements.	Turned back into Treasury.	Bank balance July 1, 1904.	Cash in Treasury July 1, 1904.	Totals.
Signal Service of the Army—					
1903.....	\$6,441.12	\$754.00	.....	\$312.62	\$7,507.74
1903, coast artillery.....	60,176.39	1,176.42	.....	1,023.92	62,376.73
1904.....	169,171.42	.....	\$73.89	5,611.91	174,857.22
1904, coast artillery.....	293,306.36	.....	71,399.12	24,419.52	389,125.00
Military telegraph and cable lines, Alaska.	304,023.77	.....	117.82	321,680.00	625,721.59
Ordnance and fortification.....	1,738.50	.....	.....	.....	1,738.50
Ordnance and fortification, Barrancas.....	87.10	184.64	.....	.....	271.74
Total.....	857,969.11	2,115.06	72,156.60	370,155.56	1,302,396.33

ELECTRICAL DIVISION.

This division has been under the charge of officers in the order named: Maj. (then Capt.) Edgar Russel, Capt. George S. Gibbs, and First Lieut. W. A. Covington, of the Signal Corps. The principal work is the designing, testing, and inspecting of electrical instruments and submarine cables. Major Russel's theoretical work consisted in the preparation of instructions for the use of the telautograph and for the fire-control installation of the Signal Corps. Practically he materially improved the Signal Corps telautograph and experimented with a fire-control scheme which is to be tested by an artillery board at Fort Monroe, Va. Two batteries, the De Russy and Andrews, are being equipped at Fort Monroe. Inasmuch as several modifications have been suggested by the Board on Regulations for the Coast Artillery, the installations and tests have not yet been perfected.

Lieutenant Covington has most intelligently prosecuted the experimental work initiated by Major Russel, and many important experiments connected with the tests of instruments have been carried out under his supervision.

TELEGRAPH DIVISION.

This division remained under the charge of Capt. E. B. Ives until his untimely and much-regretted death on December 28, 1903. During the latter part of the year the work devolved upon Lieut. E. A. Jeunêt.

The volume of new business, caused by the increase of the Alaskan telegraph lines, has been enormous, but by unremitting work of the clerks in charge it has been kept up to date. During the greater part of the year the examining division has been in charge of Lieut. E. A. Jeunet.

This division exercises supervision over all means of electrical communications except such as pertain to fire control. The post telegraph systems and telephone exchanges for administrative purposes impose, by their importance and extent, much work on this division. The extent to which such means of communication are used may be inferred from the report of Gen. T. J. Wint, commanding Department of the Missouri, that during the year 188,046 messages have been transmitted in that department.

Lieutenant Jeunet is satisfactorily supervising the installation at selected posts and has initiated a system of electrical communications for target ranges, which, devised by the Signal Corps and recommended by the Board on Small Arms Firing, has been approved by the Chief of Staff.

UNITED STATES ARMY AND WAR DEPARTMENT LIBRARY.

This library, an important auxiliary to the educational system of the Army, was placed, by direct order of the Secretary of War in 1893, under the supervision of the Chief Signal Officer of the Army, who, after repeated requests, was relieved from this important but somewhat onerous duty on April 9, 1904, by the second division of the General Staff.

During the eleven years of supervision by the Chief Signal Officer the number of volumes has doubled, numbering on June 30, 49,082.

Under its efficient librarian, Mr. James W. Cheney, the importance and utility of the collection have largely increased. Modern library methods have been introduced, its contents classified, and the more important volumes catalogued. The fiction, about 600 novels, has been entirely eliminated by distribution to army posts. Four useful finding lists have lately been issued. Improved methods of imparting accessions have been adopted. There were 2,274 accessions during the year—606 were purchased, 758 were by exchange, and 910 were gifts. The local circulation has been about 5,000 volumes, while there have been loaned to army officers at distant posts 225 volumes.

For historical and technical reference this library is often visited by authors and consulting students, who appreciate its valuable resources and easy accessibility. The library not only contains the highest authorities on military history and science, but has one of the finest collections of Congressional documents in existence.

DISTRIBUTION OF WAR DEPARTMENT DOCUMENTS.

Publications issued by the War Department were distributed until April 9 under the supervision of the Chief Signal Officer, and after that date by the second division of the General Staff.

From July 1, 1903, to April 9, 1904, the following transactions are reported: Publications received, 43,017 volumes; publications distributed, 55,362 volumes, of which 30,633 volumes were to the Army,

19,826 to the National Guard, and 569 to other departments of the Government. There were distributed to the general public 4,334 publications, consisting of surplus volumes of Government prints which were no longer needed for official purposes.

Special efforts were made to relieve the Department of the enormous quantities of Government publications which have accumulated during the past twenty-five years. There were transferred of these surplus documents about 50,000 publications, almost entirely Congressional titles, to the Superintendent of Public Documents.

A. W. GREELY,

Brigadier-General, Chief Signal Officer of the Army.

THE SECRETARY OF WAR.

REPORT OF THE CHIEF OF ARTILLERY.

REPORT OF THE CHIEF OF ARTILLERY.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ARTILLERY,
Washington, November 3, 1904.

SIR: I have the honor to state that in preparing this annual report have been guided by the following Army Regulation:

A. R. 294, 1904.—It shall be the duty of the Chief of Artillery to keep the War Department advised at all times of the efficiency of the personnel and material of the artillery, and he shall, as circumstances require, make such recommendations in reference thereto as shall, in his judgment, tend to promote efficiency.

THE LATE CHIEF OF ARTILLERY.

It was my good fortune to have succeeded to the office of Chief of Artillery after the more pressing problems following the abolition of the regimental organization, and the establishment of the Artillery Corps upon the new conditions formulated in the law approved February 2, 1901, had been solved by the tact and ability of my predecessor, Brig. Gen. Wallace F. Randolph, the first Chief of Artillery in the permanent establishment since General Knox held that office in 1776. His deserved promotion to major-general was a fitting recognition of the value of his services in peace and war.

COAST DEFENSE.

At this time more than one-half of the armament contemplated by the Endicott board for the coast defense of the United States has been mounted. The expenditures so far have been mainly for emplacements and for guns.

Accepting present conditions, the two most essential elements of defense which should be immediately provided and which will secure the greatest measure of public safety at the least cost are:

1. The completion of the torpedo defense of our fortified harbors and provision for a trained personnel to operate it.

2. The installation at all of our batteries of the approved range and position finding equipment and the other accessories for defense, without which our guns are deprived of two-thirds of their value by day and of all or of nearly all of their value at night.

TORPEDO DEFENSE.

The best and most economical use of the entire armament, including the torpedo defense, requires one complete relief to man each and every element of defense. It is inconceivable that Congress after appropriating so many millions for national defense would be willing, if its attention were drawn to the fact, to leave this defense ineffective for want of a proper organization to man and conduct it.

Recent events have particularly emphasized the value of torpedoes, which form the first line of defense of a fortified harbor. The most valuable lesson learned thus far from the Russo-Japanese war is their paramount importance for harbor protection.

Torpedoes by themselves can not protect a harbor and can not protect themselves. To have any defensive value they must be supported by guns, since without the support of guns they can be countermined or in other ways made innocuous, and thus allow a safe passage to hostile vessels; but if, as at Port Arthur and Vladivostok, torpedoes are co-operated with a proper armament, it is not probable that any enemy, however enterprising, will attempt to force their line of defense.

To secure at the present time the greatest measure of national safety at the least cost, the entire torpedo defense of our harbors should at once be made complete. The cost of the completion of this defense is estimated at \$3,819,420, or a little more than one-half of the cost of a fully equipped battle ship. It would be criminal neglect if I did not urge, as earnestly as I can, the immediate completion of the torpedo defense of all of our fortified ports. To-day this defense is lamentably deficient both in material and personnel.

If a harbor is to be seriously attacked with a view to forcing an entrance, such an attack will probably be made within a week or ten days after a declaration of war, or it may even precede a declaration. If we were suddenly confronted by war no amount of money could procure submarine mines in time to be of service for our harbor defense. Torpedo cases, cables, electrical or other appliances of special design for torpedo defense are not commercial articles kept in stock to supply a demand, but are only made to fill orders, and their delivery will occupy many months. The lack of a single part may render the whole equipment for the torpedo defense of a harbor inoperative.

We can not afford to wait for war to prepare our torpedo defense, but must be prepared for the anticipation of war. In the event of war only those mines, cables, and many other appliances can be utilized which are already on hand; none can be acquired in time for effective use against early attack.

In this matter of submarine defense, the Torpedo Board remarks:

It can not be too strongly stated nor too often repeated that there is not at the present time a single artillery post, among all the thirty or more presumably supplied with a submarine mine equipment, that is complete or even approximately complete in its equipment of material and proper buildings for caring for the material and operating the system as contemplated in and measured by the standard laid down in the Torpedo Manual.

Even after we have the complete material of our torpedo defense, it is practically valueless unless we have a trained personnel carefully instructed to operate it. To-day we are substantially without such a force. Four companies of coast artillery in the harbors of New York, Boston, Hampton Roads, and San Francisco have been provisionally

designated as torpedo companies, the object being to determine in a tentative way the best means and methods of carrying on the submarine mine instruction in the different harbors in a more definite and satisfactory manner than has been accomplished in the limited time given to such instruction under previous conditions and regulations. This action is confessedly a makeshift, since we can now assign for this purpose only about 400 officers and men, when we really need about 5,000 for the service. The Torpedo Board estimated the personnel required to man and serve the whole submarine defense of our country, including all the electrical plants at fortifications, as 5,139 officers and men.

The officers and men assigned to the submarine defense will not only operate the torpedo defense, but after their mines are planted they will protect their mine field by rapid-fire guns, and also will be charged with the care and operation of power plants, searchlights, and other accessories. Their employment for the latter purpose will solve one of the most perplexing problems which has confronted the coast artillery. Artillery for the submarine defense will not cease to be coast artillery, but as its service is with the minor calibers of guns it will not require as long and thorough an artillery training, especially in the duties of range finding, as will the coast artillery assigned to the guns of heavier caliber.

It would be most unwise to attempt to provide a personnel for the submarine defense of the country by taking it from the present force of coast artillery, since to-day we have less than one-half of the officers and men required to man and serve the armament already provided.

Great progress has been made in the development of submarines, and now they have become a formidable element in sea war, both in attack and defense. This new instrument in warfare is especially interesting to the coast artillery, since it can be effectively used in channels too swift or too deep to employ the typical torpedo, and since it also provides the most simple and best means of inspecting the mine field, and of making in place any repair to the mining material under water that may be necessary.

When submarines are to be used for these purposes they must be an inseparable part of the harbor defense, and be under the immediate orders of the commanding officer of the battle command. This statement is emphasized because the (Army and Navy) Joint Board has recommended that the crew of submarines shall be furnished by our Navy, but it should be made clear that the submarines intended wholly for harbor submarine defense are to be under the exclusive orders of the artillery commander.

In this connection it is interesting to note that the employment of wireless telegraphy, torpedoes both fixed and mobile, and submarines has probably changed the tactics of blockade. Blockading fleets will no longer remain near the harbor invested, but many miles away, and generally beyond sight.

POSITION FINDING.

The measure of artillery efficiency is its ability to make the greatest number of hits in a limited time, and hitting depends, especially for long ranges, upon rapid and accurate range finding.

Artillery efficiency depends upon drill and instruction in the service of the gun and of the position-finding equipment. Efficiency in the coast artillery does not depend wholly upon the "man behind the gun." All members of a gun section have their fair and important share in the effective work of the gun; yet the men who are directly responsible for the hitting are those who form the details of the position-finding service. The efficiency of the gun in action as measured by hits depends almost entirely on their skill and training.

The advantages of guns mounted on land over guns of the same caliber on ships are very marked, and are chiefly as follows:

1. The army gun for the same length in calibers is heavier, in consequence more strongly constructed than the naval gun, and can therefore safely fire a projectile delivering a heavier blow at the longer fighting ranges.

2. The gun on land has a stable platform; the naval gun is on an unstable platform.

3. The gun on land can utilize range and position finders, depending either on horizontal or on vertical bases which will give the ranges of the target well within the limits of accuracy of the gun employed. In fact, so accurate is our system of position finding that we obtain excellent practice in firing from our mortars at moving targets, although the target can never be seen from the mortars themselves when they are fired. With our position-finding equipment, our large guns are effective against an enemy at the extreme range of 6 miles for the 10-inch and 12-inch guns and 12-inch mortars, and at correspondingly less ranges for smaller calibers. Without a position-finding equipment shots are practically wasted if fired at ships at more than 2 miles range, which means that, with a position-finding equipment, the efficiency of the land armament is increased by beginning an engagement against hostile vessels at about three times the distance we could expect effective fire without it. Land guns with position finders have this immense advantage over naval guns, and it would be extreme folly not to utilize this advantage to the fullest extent. This advantage of shore guns is more marked at the longer ranges, since the rapid-fire guns on ships are not effective against artillery material and personnel except at the shorter ranges.

There has been developed in our coast artillery a system of fire action that, as far as I can ascertain, is not equaled in the world; but its accomplishment depends upon a standard equipment, which is not completely installed in any of our harbors. We have still to improvise in many harbors means of position finding in order to conduct our artillery target practice, and in such harbors we have no installation for directing the fire action of the higher units, such as a fire command or a battle command.

Our system of position finding and fire direction is no longer experimental. It has been tested by carefully conducted and exhaustive trials, and upon the favorable report of a board of competent officers has been approved by the Secretary of War. It is most important in the interests of efficiency of service that this system should be installed at all our forts. To double our armament would not increase the effectiveness of our defense as much as would the complete installation of the approved position-finding system for the guns already mounted.

The poor showing made by the Russian coast artillery guns at Port Arthur against the Japanese fleet has caused surprise; but General

of Artillery Martushev gives the following public explanation in the Russki Invalid which illustrates my views:

The remarkable action of the Quantoon (Port Arthur) fortress artillery as manifested during the repulses of the Japanese fleet leaves nothing to wish for in what concerns the shooting at middle and short ranges. But when the ranges are 10,000 or 12,000 meters this artillery does not shoot at all or fires without results. If it were otherwise, it could never have happened that the bombardments of Port Arthur, lasting sometimes several hours without interruption, were without results, when under the circumstances every minute ought to have caused the loss of some ship, small or big, losses of lives not reckoned.

It would be impossible, if we have our position-finding equipment completely installed, for hostile vessels to remain at 10,000 or 12,000 meters from our batteries of 12-inch guns or mortars for two or three hours and not be destroyed. I regret, however, to have to say that even at this day most of our fortified harbors are not better supplied with a position-finding equipment than apparently is Port Arthur.

This year for the first time boards of officers, acting under definite instructions as to the electrical problems involved in light, power, and communication, will have fixed and located horizontal base lines at all our fortified harbors on the Atlantic and Pacific coasts, and for the first time we will be able to furnish Congress with estimates necessary to complete the range and position-finding system for our mounted armament, according to the approved scheme. Money appropriated for position-finding equipment will give a larger return in increase of artillery efficiency than for any other purpose known to me.

In its annual report for 1903 the Board of Ordnance and Fortification recommended that \$2,000,000 should be appropriated each year for the next several years for range finders and other instruments for fire control, the installation of additional searchlights, and the necessary cable for conducting the electric power to various parts of the fortifications and furnishing the essential lines of communication, and made remark as follows:

The Board is aware of no object for which such sums of money can more effectively be expended or from which greater benefit will be derived.

In its annual report for 1904 the Board of Ordnance and Fortification expresses the following opinion:

Another of the most important features of the seacoast armament has not been adequately provided for, and this is the installation of the proper fire-control system at each coast artillery fort. Ample provision should be made for the purchase of range finders and other instruments for fire control, the installation of additional searchlights, and the necessary cable for conducting electric power to the various parts of the fortifications and furnishing the essential lines of communication. Each battery of heavy-caliber guns should have its position-finding system installed as soon as the guns are mounted. It is the best known means by which accurate artillery fire can be secured for the usual battle ranges, and the Board is of the opinion that in the present state of the coast defense money can be more advantageously expended for fire control than for any other permanent installations, since it is more desirable to increase the effectiveness of existing than to install new armament.

In this connection the following quotation is made from the annual report for this year of Major-General Corbin, commanding the Atlantic Division.

All fortifications now existing should be fully completed, both as to guns and emplacements, and as to accessories, and this should take precedence of new constructions. (*Italics mine.*)

ARTILLERY ORGANIZATION.

The act of February 2, 1901, establishing the Artillery Corps and abolishing the regimental organization undoubtedly did much to increase the efficiency of the artillery, but it did not go far enough in completely divorcing the coast artillery from company organization and regimental traditions. That act gave the artillery, so far as officers are concerned, substantially the organization of thirteen regiments of infantry or cavalry, but it did not recognize the fact that the number of officers in each grade should depend upon the requirements of the coast and field artillery service, and unfortunately it preserved for the coast artillery a fixed company organization. An organization which will provide a specific number of officers and non-commissioned officers in each grade and of privates would be the best for the coast artillery.

By the act of March 2, 1899, each battery of field artillery should have two first lieutenants. No provision was made for this additional lieutenant in the reorganization of the artillery by the act of February 2, 1901. This additional lieutenant can only be supplied by depriving thirty companies of coast artillery of a lieutenant, which they should have. When field batteries have this additional lieutenant it is at the cost of the efficiency of the coast artillery; if the field artillery does not have this lieutenant it is at the cost of its own efficiency.

The present law does not provide enough majors and lieutenant-colonels to command the battalions of field artillery and the fire commands of coast artillery. Captains have commands that belong to majors; majors perform the duties of lieutenant-colonels, and lieutenant-colonels command artillery districts which should be commanded by colonels. The field artillery containing 30 batteries should have colonels assigned to it, but no organization of field artillery which can be considered a proper command for a colonel is recognized by law, and but a single provisional regiment is recognized by orders to which is now assigned a lieutenant-colonel.

In the coast artillery the most important staff officer, by reason of the technical nature of his duties, is the artillery engineer, and there should be one in every fortified harbor. There is no corresponding staff officer in the infantry or cavalry; he is not provided for by law, and is only obtained by depriving some company of its captain or lieutenant. Torpedo planters, intended in time of peace for the instruction of coast artillery in the laying of submarine mines and in time of war for planting mines for harbor defense, are commanded by captains who must be removed from their companies for that purpose.

The noncommissioned staff in artillery battalions, or artillery fire commands, is less than in the cavalry or infantry battalion, though the artillery has equal and in many cases greater need for their services.

While discussing the question of coast artillery organization, I ought to invite special attention to the fact that the personnel now authorized for the coast artillery is not sufficient to man and serve one-half of the armament already mounted. This means if a war were to break out we have not one-half the trained force required to serve our guns effectively. However good our guns are, yet one-half of them would not be of much more use than so many tons of inert metal. Coast artillery personnel can not be improvised; to be efficient it must have

long and careful training. However immediate war may seem, this deficiency in skilled personnel can not be remedied without an act of Congress.

Three-fourths of our coast artillery is stationed in the Atlantic Division. The last two commanders of this division were General Chaffee (now the Lieutenant-General and Chief of Staff) and General Corbin, Adjutant-General. Both of these officers, after a careful consideration of the needs of the coast artillery at the posts on the Atlantic and Gulf coasts; have made the following reports:

Major-General Chaffee in 1903:

* * * * *

The duties imposed upon the coast artillery in this department are very onerous now, so great indeed as to require that attention be invited to the necessity of an increase in its strength as a measure of relief and to meet fairly new development of defenses made year by year. It would seem reasonable that one relief be taken as the minimum of strength of coast artillery troops necessary for the care of armament and instruction of men for this highly important section of national-defense system. At present less than 10,000 men are available in this department, while over 15,000 are required to compose one relief.

* * * * *

Major-General Corbin makes the following statements and recommendations in his annual report for 1904:

* * * * *

The time has now come when legislation is again needed for the coast artillery. This legislation should cover both increase of numerical strength and pay, and also change in organization. By careful consideration of the defensive works now existing or to be completed by the end of the fiscal year, in the Department of the East, and, doubtless, same conditions obtain elsewhere, it is found that the number of men necessary for the proper working and care of the armament should be very materially increased. The increase in the coast artillery in 1901 was a great relief, and for a time sufficient to meet the needs of this arm, but it no longer suffices. There are at present in the Department of the East^a 70 companies of coast artillery, nominally aggregating 7,600 enlisted men, although, due to the large number of vacancies, far short of that number. The number required for the proper care and use of the present armament is fully twice the above, allowing for but one relief, and assuming the total strength of companies available for duty at the guns, which, it is well known, is never the case. The number thus stated as necessary for the fortifications includes men for the service of the submarine mine defense. This service is being rapidly developed, and it is imperative that the total number of coast artillery men include enough to man the submarine mine defenses. It is proper to draw attention to the fact that the increase under the law of 1901 took no account of the need of men for this service.

The matter of organization of the coast artillery as to division into units also demands attention. As a matter of fact, there should be no such thing as a fixed strength for companies; indeed, the company feature should be entirely eliminated. The number of officers and men necessary to man with one relief our fortifications should be provided, and then these officers and men assigned to the various works as the conditions may require, the same as so many officers and sailors are assigned to a man-of-war, according to the needs of the particular vessel.

The matter of pay of enlisted men of artillery also demands attention by the law-making power. Experience has shown that it is difficult to keep even the present companies recruited to their full strength. The reasons for this are not far to seek. The pay of an artillery soldier is practically the same as that of an infantryman or cavalryman. While for a majority of the privates there is no reason for making any distinction between them and privates of other arms, it is indisputable that the non-commissioned officers and those of the privates who have qualified as gunners should receive a higher rate of pay than at present. Service of requisite character is obtained in this world only by proper pecuniary remuneration.

^a Ninety-three companies of coast artillery are stationed in the Atlantic Division of which the Department of the East forms a part, and the conditions applying to the department apply also to this division and to the Pacific Division.

If we expect to have men of the grade of intelligence necessary for the more skilled operations connected with modern coast artillery, with its accessories in the way of range finders, searchlights, communications, etc., to exercise that intelligence and to stay with the colors, we must pay for it. For these reasons, it is regarded as only good business policy to give to noncommissioned officers and such privates as have shown themselves qualified as expert artillerists, a rate of pay that will hold them in the service. At present, taking as it does, nearly three years to train these men to a good degree of proficiency, the Government then loses them at the expiration of that time, for very few reenlist.

Above all, the greatest efforts should be made to retain in the service men who have shown themselves expert gunners, i. e., men who can actually train the gun and hit the target, not simply men who have a knowledge of the theory of gunnery. A man who can hit the target, not once, but time after time, showing thus an inborn faculty for the work, should be retained at all hazards, be he noncommissioned officer or private, a well-conducted soldier, or one not well conducted.

After all, in the coast artillery as in the other combatant arms, the main object is to hit.

Taking all these facts into consideration, the need for Congressional action is urgent. I say this, not for the benefit of the officers of the artillery, or of the artillery arm, but for the Army and the nation. Elaborate preparations and large allotments have been made for building the necessary emplacements and the construction of the guns and carriages. A great part of the guns and carriages are now in place. To use them properly is the function of the coast artillery. Unless they are properly used, it is so much money practically thrown away. Should war arise, and the officers and men be not sufficient in number, or be deficient in training, disaster would follow; or, if not disaster, certainly not eminent success.

I therefore very strongly advocate that the coast artillery be increased at least one-half, and the pay of the enlisted men of the grades noted raised.

* * * * *

COMMISSIONS IN THE ARTILLERY.

It is a source of pardonable gratification to the Chief of Artillery that for the first time in our Army candidates for appointment into the artillery from civil life or from the ranks must, under existing orders, possess an educational qualification which will give reasonable assurance that the officer will be able to master the technical duties of his profession.

The qualifications are the minimum qualifications which will serve as a foundation for professional efficiency, but they do not exceed those included in the usual course of instruction in the average high school of the country.

It is interesting to observe that three years before the President established this standard for appointment from the ranks or from civil life Congress in the act of February 2, 1901, fixed a standard in these words:

Second lieutenants of infantry or cavalry may in the discretion of the President be transferred to the artillery arm * * * and such transfers shall be subject to approval by a board of artillery officers appointed to pass upon the capacity of such officers for artillery service.

EFFICIENCY OF ARTILLERY OFFICERS.

Artillery efficiency depends so much upon the efficiency of its officers that every effort should be made to secure it.

Under existing law schools have been established to qualify junior officers in all branches of their profession. The Government provides abundant opportunity for such officers to qualify themselves professionally, and the law imposes a penalty if a junior fails to show qualifications for the duties of the next higher grade. By law officers in our Army of lower rank than major are now required to pass an

examination prior to promotion. Undoubtedly this law has done much to stimulate professional study in the grades affected by the legislation. With an increase in rank comes an increase in duties and responsibilities, but, wonderful to say, in our Army no officer of higher rank than captain is required to demonstrate his professional fitness for his new duties. Instead of requiring an officer in the higher grades to show upon promotion that he is qualified for his new duties and responsibilities, the initiative is placed upon the Government to show that an officer is disqualified should such be the fact. As the law now exists, after an officer has reached the rank of major in the Army we have to accept all future promotions without reference to his fitness or qualifications for the higher grades.

In the Navy all officers are required to prove their fitness for the next grade, and it would undoubtedly add much to artillery efficiency if the law providing for examination for promotion were extended to include all grades. The examination for promotion of a field officer should show that he is physically and morally qualified; his record should be closely scrutinized for general efficiency in the lower grades, and he should demonstrate by practical example, as far as the artillery is concerned, that he is capable of exercising the command which belongs to the grade to which he will next be promoted. For instance, in the coast artillery a major prior to promotion as lieutenant-colonel should show that he is qualified to exercise battle command, and a lieutenant-colonel should show that he is capable of exercising artillery district command. Field officers should not be examined in textbooks.

Now let us examine the practical workings of the present law for examination for promotion. In the artillery, as far as I am informed, an occasional lieutenant has been discharged the service as a result of being unable to pass the professional examination for promotion to the next higher grade. In the artillery one captain so far has been suspended for a year for failing to qualify professionally for the next grade. So far no artillery captain has been discharged the service for failure to pass a professional examination for promotion. Captains of artillery who are now being examined for promotion to the grade of major have been between twenty-five and thirty years in the service. If a board of examination for promotion finds an officer physically disqualified for service such officer is retired on three-fourths of the pay of the grade to which he is next to be promoted; but if he be professionally disqualified there is no consideration for his long term of service; under the law he must be discharged with one year's pay, and there is no other alternative.

It is unjust that after a man has served his country many years faithfully and honestly that he should be wholly discharged the service by reason of a mental incapacity less than unsoundness of mind, possibly incident to the service, to perform the duties of the next higher grade, while if he were physically incompetent to an equal or even less degree he would be retired with a comfortable provision for the rest of his life. It is probably the injustice of this fact which makes it so difficult for an examining board for promotion to find, upon a second examination, an officer of long service and good habits professionally disqualified for promotion. It is my opinion that the only just remedy for such a condition of affairs would be to retire officers for faithful service who may fail professionally for any cause

other than their own fault upon a retired pay of 2 per cent for each year of actual service.

It is the general understanding that in the event of war the organized artillery militia will furnish the second relief to man the coast armament. The interests involved in our coast defense are so vast and so closely connected with our national safety that no field officer of the artillery militia should be allowed to exercise artillery command adequate to his rank before he has demonstrated his professional fitness. No one will probably question the wisdom of this statement. Can we ask to have militia officers demonstrate their fitness and still refuse to require field officers of the regular artillery to show their fitness? It does not matter how inefficient a major, lieutenant-colonel, or colonel of artillery may be in the discharge of his duties, he can not be discharged or retired unless such inefficiency is due to bad habits or physical infirmity. However inefficient a field officer may be, we now have no means of eliminating him from active service so long as his conduct remains good.

STAFF DETAILS.

Staff details, as distinguished from the details to the General Staff, are those details authorized by law, for four years in the Signal, Ordnance, Quartermaster, Commissary, Pay, Adjutant-General, and Inspector-General's departments.

These details do not concern the Chief of Artillery other than as they affect artillery efficiency. It is my judgment that it is a distinct professional disadvantage for an artillery officer to be removed for four years from his corps for duty in the Pay or Commissary departments, and without equivalent gain to these departments. It is to the advantage of an artillery officer to have a tour of duty in the Quartermaster, Signal, Ordnance, Adjutant-General's, or Inspector-General's department.

TACTICAL RELATIONS OF COAST TO FIELD ARTILLERY.

There is in all armies a determined ratio between the field artillery, infantry, and cavalry which should fix for an army of a given size the amount of its field artillery. The coast artillery has no such relation to the other arms of the service. We have fortified our harbors and should have in peace, in order to secure the most effective results in war, at least one relief of coast artillery to man the armament, including all the accessories of range finders, searchlights, and submarine mines. If we had no infantry or cavalry we would need no field artillery. If we had no fortifications or harbors to defend, we would need no coast artillery, however much field artillery we might have. This statement is made in order to make clear the tactical independence of the coast artillery and field artillery with respect to each other, and to show that the needs of field artillery and coast artillery should be considered separately. The personnel of the coast artillery is a distinct body, and is not correlated tactically with any other branch of army service.

FIELD ARTILLERY.

It is a remarkable fact that our field artillery was not organized in our great civil war or in our late war with Spain so as to secure the most effective service. It is incredible in the light of contemporaneous

experience that it should have been so systematically crippled in both wars. The conditions which limited the effectiveness of field artillery in the civil war are so graphically described by General Hunt, Chief of Artillery, Army of the Potomac, that I can not do better than to quote from two of his reports:

[Report to General Hooker, commanding Army of the Potomac, August 1, 1863.]

* * * * *

In justice to the artillery and to myself I think it necessary to state certain circumstances affecting its condition and losses in these operations. The command of the artillery, which I held under Generals McClellan and Burnside, and exercised at the battles of Antietam and Fredericksburg, was withdrawn from me when you assumed command of the army, and my duties made purely administrative under circumstances very unfavorable to their efficient performance.

I heard after the movement commenced that when the corps were put in motion to cross the river they left part of their artillery in their camp. No notice of this was given to me, and it was only by accident that I learned that the batteries so left behind were afterwards ordered to rejoin their corps. As soon as the battle commenced on Friday morning I began to receive demands from corps commanders for more artillery, which I was unable to comply with, except partially and at the risk of deranging the plans of other corps commanders. That same morning I was ordered to Banks Ford to take command there, and was absent at that place until the night of the 3d from general headquarters.

The promotion of many of the old artillery officers and the invariable transfer which accompanied it to other duties weakened the regular batteries exceedingly and at the same time deprived the divisional artillery of experienced commanders.

The limitation of officers of 4-gun batteries crippled the volunteer service, and the want of field officers added to the great difficulties under which the arm labored. It will, perhaps, hardly be believed that for the command and management in their operations of the artillery of the army, consisting of 412 guns, 980 artillery carriages, 9,543 men and officers, and 8,544 horses, besides their large ammunition trains, there were but 5 field officers of artillery in the army, and from the scarcity of officers of inferior grades these officers had miserably insufficient staffs. Add to this that there was no commander of all the artillery until a late period of the operations, and I doubt if the history of modern armies can exhibit a parallel instance of such palpable crippling of a great arm of the service in the very presence of a powerful enemy, to overcome whom would require every energy of all arms under the most favorable circumstances. It is not, therefore, to be wondered at that confusion and mismanagement ensued, and it is creditable to the batteries themselves and to the officers who commanded them that they did so well.

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[Report to commanding general Army of the Potomac, September 27, 1863.]

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In my report of the battle of Chancellorsville I took occasion to call attention to the great evils arising from the want of field officers for the artillery. The operations of this campaign, and especially the battle of Gettysburg, afford further proof, if such were necessary, of the mistaken policy of depriving so important an arm of the officers necessary for managing it. In this campaign, for the command of 67 batteries (372 guns), with over 8,000 men and 7,000 horses, and all the material, and large ammunition trains, I had 1 general officer commanding the reserve and but 4 field officers. * * *

In the seven corps the artillery of two were commanded by colonels, of one by a major, of three by captains, and of one by a lieutenant, taken from their batteries for the purpose. The two brigades of horse artillery attached to the cavalry were commanded by captains, and there was one field officer in the reserve. The most of these commands in any other army would have been considered proper ones for a general officer. In no army would the command of the artillery of a corps be considered of less importance, to say the least, than that of a brigade of infantry. In none of our corps ought the artillery commander to have been of less rank than a colonel, and in all there should have been a proper proportion of field officers with the necessary staffs. The defects of our organization were made palpable at Gettysburg, not only on the field but in the necessary and important duties of reorganizing the batteries, repairing damages, and getting the artillery in condition to renew the battle or take the road in efficient condition on the morning after a conflict. * * *

Not only does the service suffer necessarily from the great deficiency of officers of rank, but a policy which closes the door of promotion to battery officers, and places them and the arm itself under a ban, and degrades them in comparison with other arms of service, induces discontent, and has caused many of our best officers to seek positions wherever they can find them, which will remove them from this branch of the service. We have lost many such officers, and unless something is done to cure the evil we will lose more. * * *

These reports were penned more than forty years ago, yet the conditions then existing in the field artillery have not yet been remedied.

As far as this office has been able to ascertain by careful inquiry no better methods have been practiced with our field artillery in the recent army maneuvers than have obtained for the last fifty years. Thus strong are the fetters of tradition.

Field artillery should bear a definite ratio to the cavalry and infantry of an army, and if it falls below this ratio it can not be expected to fill the desired measure of efficiency. In Europe there has been a marked tendency in late years to increase this ratio, while in our Army it is now much below the acknowledged tactical needs of the permanent establishment.

We have in our Army 30 regiments of infantry and 15 of cavalry. Assuming three regiments to a brigade and three brigades to a division, we have of infantry and cavalry the equivalent of five divisions. Each division should have at least nine batteries of field artillery, organized into three battalions of three batteries each, and each battalion commanded by a major or lieutenant-colonel. The divisional artillery of three battalions should constitute a regiment and be commanded by a colonel. Existing law only provides for 30 batteries of field artillery, which is fifteen short of the number tactically needed for the present infantry and cavalry organizations, without estimating for reserve batteries and siege batteries. It is generally admitted that field artillery requires more time to make efficient than either cavalry or infantry, which is a conclusive reason why our Army should have its proper tactical proportions. There is no first-class power which has so systematically neglected its field artillery as the United States.

Divisions, corps, and armies should have their chiefs of artillery, who should be in actual command of all of their field artillery, and they should be provided with adequate staffs. The chief of artillery of a division should be a colonel, of a corps a brigadier-general, and of an army a major-general. Field artillery should in time of peace be organized into tactical units, corresponding at least to the organization that would be required for a division in field maneuvers. A colonel is the proper rank for the chief of the divisional artillery. As a matter of fact, no colonel is assigned to our field artillery, and, with the exception of one provisional regiment of field artillery, there is no field artillery command as now organized appropriate for that rank.

In presenting these recommendations I have, in a general way, conformed to the conclusions of the General Staff, so far as they have been formulated with respect to the field artillery. With this explanation I wish to say that the General Staff has only recommended about two guns for each 1,000 men, while abroad the number of guns is usually about four per 1,000 men. In my judgment the experience of the Russo-Japanese War is conclusive that the foreign practice is better than the one proposed for our service.

Under the law organizing the artillery corps 125 officers is the proper proportion for duty with the field artillery. The law provides for 30 batteries with 4 officers each, or 120 officers for the battery organ-

ization, leaving but 5 for the command of the battalions and divisional artillery regiments, with the necessary administration staffs, a manifest impossibility. Many foreign armies have 5 officers in the battery organization, and we know we can not reduce the number to 3 officers without a great loss of efficiency.

The present battalions and provisional regiment organized by Executive order obtain staff officers for administration at the expense of battery efficiency. The efficient employment in action of modern field artillery very greatly increases the demands on staff officers.

A striking illustration of the defects of our field artillery organization with respect to a proper complement of officers may be obtained by a comparison with the cavalry. Taking both on a war footing, the three battalions constituting the divisional artillery for a division of infantry will have 1,800 men, 1,300 horses, 180 artillery carriages, and 36 rapid-fire guns. A cavalry regiment will have 1,236 men and 1,300 horses.

The artillery has nearly 50 per cent more men than the cavalry, and has all the guns and carriages mentioned to care for, maneuver, and fight; yet only 38 officers can be assigned to this command unless we rob the coast artillery for the purpose.

The cavalry regiment has 50 officers. If efficiency depends upon a proper supply of officers, comment is unnecessary.

Unless additional officers for field artillery are provided by legislation, no further progress can be made in field-artillery organization.

ARTILLERY SPECIALISTS AND THEIR PAY.

In the artillery many of the noncommissioned officers are required to perform services which require considerable natural ability and a long period of technical instruction. It has long been recognized that the pay of such specialists is not adequate to the responsibility and importance of the work required of them, and it is shown by experience that a majority of these instructed men find little inducement to remain in the artillery service and generally leave it upon the expiration of their enlistment.

Attention is invited to a comparison of the pay these men receive with that received by men occupying similar positions in the Navy. In the Army the clothing allowance is in addition to the pay proper, and in the figures given its value is added to the latter for the purposes of comparison. Pay for length of service and bounties are not computed in the figures given.

<i>Coast artillery.</i>	<i>Navy.</i>
Gun commander, \$24 per month.	Turret captain, \$50 to \$70 per month.
<i>At guns of 8-inch or larger caliber.</i>	<i>At guns of 8-inch or larger caliber.</i>
Gunners:	Gun pointers:
First class, \$2 per month extra.	First class, \$10 per month extra.
Second class, \$1 per month extra.	Second class, \$8 per month extra.
<i>At guns of calibers from 4 to 7 inches.</i>	<i>At guns of calibers from 4 to 7 inches.</i>
Gunners:	Gun pointers:
First class, \$2 per month extra.	First class, \$8 per month extra.
Second class, \$1 per month extra.	Second class, \$6 per month extra.
<i>At guns of 3-inch or smaller caliber.</i>	<i>At guns of 3-inch or smaller caliber.</i>
Gunners:	Gun pointers:
First class, \$2 per month extra.	First class, \$4 per month extra.
Second class, \$1 per month extra.	Second class, \$2 per month extra.

These figures show that the most poorly paid naval gun pointer receives the same additional compensation as that given to the most highly paid coast-artillery gunner.

The act granting pay to coast-artillery gunners was approved February 2, 1901. Since that date many causes have contributed to increase the demands upon training and intelligence of the coast artillery enlisted men. The equipment of our coast batteries has been largely increased, combined army and navy maneuvers have been held, the ammunition allowance for coast-artillery practice has been increased, and is now for the first time approximately sufficient; the use of searchlights has been developed and night work has become a prominent feature of instruction; electricity has daily increasing application in coast defense, and the system for the direction and control of coast-artillery gun fire has been greatly developed and perfected. New conditions are constantly increasing the necessity for specializing both by officers and men. The necessity for specialists has been recognized by War Department orders authorizing the following positions for enlisted men directly connected with the service of our coast-defense guns: Gun commander, observer, chief plotter.

Men occupying these positions are excused from guard and fatigue duty. They are appointed from "first-class gunners." They are to be given distinctive chevrons. This is the full extent to which the War Department can, without further legislation, compensate them for the skill and training they must possess to discharge their special duties. A man qualified to hold any of these positions incidentally receives education and experience which fits him for better-paid positions in civil life than he can now find in the artillery. He does not reenlist, and the labor of fitting another man has to be undertaken. For the efficient service of a battery there are required, including the specialists referred to, from 13 to 52 specially qualified men depending upon the number of guns mounted and their caliber.

These positions are all connected with the gun service and are separate and distinct from those requiring special electrical and steam-engineering qualifications. About 2,000 enlisted men are now filling these positions at the guns now in commission. It is certain that the only effective inducement to cause them to reenlist will be to recognize their value by increasing their pay.

The state of equipment of the coast defenses has now reached a point where further specialization is a necessity to obtain efficiency. The special positions recommended at gun batteries, *in commission*, and in torpedo companies are given below. They are divided into classes for the purpose of providing a basis upon which to recommend additional rates of pay.

I. AT GUN BATTERIES.

<i>Classes of specialists.</i>	<i>Number and duty.</i>
Gun commander:	
First class	1 for each 8-inch, 10-inch, and 12-inch rifle and each mortar pit.
Second class	1 for each 4-inch to 6-inch rifle, inclusive.
Third class	1 for each 15-pdr. rapid-fire gun.
Observer:	
First class	1 for each primary observing station.
Second class	1 for each secondary observing station.
Chief plotter	1 for each plotting room, primary station.
Range keeper	1 for each 6-inch, 8-inch, 10-inch, and 12-inch rifle, and each mortar pit.

*Classes of specialists.**Number and duty.***Gunner:**

- First class 2 for each 6-inch rapid-fire gun.
- Second class 2 for each 8-inch, 10-inch, and 12-inch rifle.
- Third class 3 for each rapid-fire gun less than 6 inches in caliber.
- Fourth class 2 for each 12-inch mortar.

Ammunition sergeants:

- First class 1 for each mortar pit and 8-inch, 10-inch, and 12-inch rifle.
- Second class 1 for each 4-inch to 6-inch gun, inclusive.
- Third class 1 for each 15-pdr. rapid-fire gun.

II. IN TORPEDO COMPANIES.

*Classes of specialists.**Number and duty.***Observer:**

- First class 1 at each mine command primary station.
- Second class 1 at each mine command secondary station.
- Chief plotter 1 at each mine command primary station.

Casemate electrician.....1 for each mining casemate.**Chief planter 1 in charge of detail on torpedo planter.****Assistant planter:**

- First class 4 for each planting detail—one in each work boat.
- Second class 8 for each planting detail on torpedo planter.

Chief loader 1 for each torpedo company in loading room.**Assistant loader.....8 for each torpedo company.****Cable sergeant 1 for each torpedo company.****Searchlight operator.....2 for each searchlight.****Power-plant assistants...Varying number, depending on character of plants.**

The men occupying the positions named for guns and torpedo casemates in commission to-day number about 2,200. From one to three years are required to develop and train them. The number of first and second class gunners in the coast artillery is 4,368, who receive in the aggregate about \$84,000 additional pay. The specialists named above are all first and second class gunners, and the additional pay they now receive is not sufficient to retain them in the artillery.

The Navy pay for specially trained men is based upon the following statute (sec. 1569, R. S.):

The pay to be allowed to petty officers, excepting mates, and the pay and bounty upon enlistment of seamen, ordinary seamen, firemen, and coal heavers, in the naval service, shall be fixed by the President: *Provided*, That the whole sum to be given for the whole pay aforesaid, and for the pay of officers, and for the said bounties upon enlistments shall not exceed, for any one year, the amount which may, in such year, be appropriated for such purposes.

To secure similar benefit to the enlisted men of the coast artillery with a view to securing the reenlistment of trained specialists, the form of legislation enacted for the pay of the Navy enlisted personnel is recommended for any legislation granting additional pay to enlisted men of the coast artillery. Allowing the rates of additional pay for men actually employed on duties specified by Congress to be fixed by Executive order will undoubtedly contribute most effectively to the object sought, of retaining the services of men after they are trained in special artillery and submarine mining duties. It will permit variations in the rates allowed to each class as experience may dictate to be desirable; the proviso that the total amount appropriated for the purpose shall not be exceeded has proved a sufficient guaranty in the case of the Navy, and would so prove in the case of additional pay for coast artillery specialists.

The form of legislation granting additional pay to coast artillery gunners should be changed as indicated above, and the amount of additional pay should be materially increased. The same pay received in the Navy for similar positions is probably not necessary in the coast artillery to retain our trained men, but a much closer approximation than now exists is necessary.

In this connection special attention should be called to the pay of first sergeant. When we consider the amount of work he is required to perform, and the nature of his duties and responsibilities, he is a much underpaid man. He is continually called upon to perform the duties which should be executed by an officer, and he should never receive less pay than his highest paid subordinate. While it is true that it has long been the policy of our Government to pay selected privates detailed on extra duty as mechanics and laborers more than the noncommissioned officers (even the first sergeant's pay being exceeded in some instances), it is unquestionably bad for harmony, discipline, and efficiency in an organization.

As soon as the installation of our modern ordnance was well in progress it was demonstrated that skilled mechanics would be required to keep the guns, gun carriages and their complicated mechanism in working condition. To meet this need ordnance repair shops have been erected in all of our fortified harbors and two mechanics are included in each company organization of coast artillery. This scheme has proved a practical failure. Competent and skilled mechanics will not enlist and remain in the service for \$18 per month and the authorized allowances. The natural result has been that company mechanics are limited to "handy men" who do useful work in keeping the armament in serviceable condition, but who are, without exception, not qualified for important repairs. Such repairs are now made by ordnance machinists detailed from the arsenals, who receive from \$3.25 to \$4.50 per day.

Experience clearly shows that skilled mechanics are indispensable at all coast fortifications. For want of them a gun may be out of commission until the post can be visited by a competent ordnance machinist. Such a condition would be intolerable in war and might prove disastrous.

I am convinced that it would increase artillery efficiency if we were to have one skilled mechanic assigned to each company, who should be paid \$50 per month and the allowances of an ordnance sergeant. Such mechanics should only be appointed after a practical examination which should show them fully qualified. This scheme would probably cost less to the Government than the present method, and prove much more satisfactory.

COMBINED ARMY AND NAVY MANEUVERS.

In 1902 army and navy maneuvers were held in the artillery district of New London and of Narragansett Bay, and in 1903 in the artillery district of Portland. While these maneuvers were unquestionably of great advantage to the coast artillery, yet it must be acknowledged with regret that they were in some respects unsatisfactory. This was mainly due to the fact that the equipment and installations for the maneuvers were not completed in time for the necessary drills, exercises, and practice of the artillery troops participating in the maneuvers prior to the commencement of hostilities. In the maneuver district of Portland Harbor, 1903, this delay in installation was very

marked. In fact, it may be stated that the installations were not completed and ready to be turned over to the artillery until the very first day of hostilities.

Another feature which detracted from the value of the maneuvers was the lack on the part of the defense, especially in Portland Harbor, of all the defensive elements that should be utilized in time of war. The use of scout boats and wireless telegraphy in the collection and transmission of information should not have been denied to the artillery. The Endicott board contemplated a floating harbor defense of monitors and torpedo boats. This feature should at least have been simulated. It is certain that in order that these combined army and navy maneuvers should have their greatest value that the defense should in time of peace employ all the elements of defense, such as guns, mines, automobile torpedoes, scouts, wireless telegraphy, torpedo boats, and other floating defenses that would be available in time of war, and thus simulate as closely as possible in respect to the elements of defense war conditions. Maneuvers should not be conducted under restrictions which would be removed in time of war, and thus impose absolutely new and unfamiliar conditions.

Experience has demonstrated that the maneuver district ought always to be announced at least one year in advance of the date fixed for the commencement of hostilities, in order that the supply and construction departments shall have ample time and opportunity to complete their work in time for the artillery troops to have their drills and target practice prior to maneuvers. This remark indicates the present state of preparedness for war of our coast artillery.

UNITY OF SUPPLY.

The efficiency of the coast artillery as a fighting body is now dependent in matters of supply and construction in a great degree upon three separate Bureaus of the War Department.

The emplacements are constructed by the engineers and the guns supplied by the Ordnance Department, but to make the armament effective it is indispensable that a position-finding equipment be installed. Here enters a complication and confusion from which the coast artillery has been a constant sufferer. For the installation of a position-finding equipment, the Ordnance Department supplies certain instruments, the Engineer Department constructs observing stations and installs power and lighting plants, and the Signal Corps lays the wires for electrical communications and supplies certain instruments.

These conditions have produced complications resulting in intolerable confusion and delay. Undoubtedly these three bureaus intend to coordinate their responsibilities, yet it is impossible to exactly adjust them. The practical disadvantages of the present system have been most marked in the maneuver districts, probably because in them the logical consequences of our present defective method of supply could not escape general observation. To illustrate by an instance the present methods I will mention that recently at Fort Monroe, Va., it was desired to attach a telautograph for experimental purposes to a gun carriage. Apparently a simple matter, yet to accomplish it there was required the approval of the Chief of Artillery and the concurrent action of the Chief Signal Officer, Chief of Ordnance, and Chief of Engineers.

I do not hesitate to say that if a single one of the supply depart-

ments in question were charged with the whole responsibility of the installation of the position-finding equipment for our armament the change would result in a great increase of economy and efficiency.

The present system is so unsatisfactory to the coast artillery that it is hoped Congress may be asked to provide by legislation an adequate remedy. In these remarks I disclaim any intention of criticising any single bureau, but I can not too strongly condemn the existing system, which is now intrenched by legislation, and can not be corrected by Executive order.

PAY OF STAFF LIEUTENANTS OF THE ARTILLERY.

There is a matter which is an unfair discrimination against the artillery. The law provides that the officers who belong to the battalion staff in the infantry shall have increased pay and allowances, but the law does not authorize that such pay shall be given to artillery officers performing the same duties. The organization in the coast artillery corresponding to the squadron in cavalry, or the battalion in infantry, is the fire command, and in the field artillery, the battalion, and their staff officers who perform the same duties as in a squadron or battalion should have the same pay and allowances that the infantry and cavalry enjoy. The discrimination noticed no doubt was unintentional, but there can be no remedy without legislation.

INSTRUCTORS AT ARTILLERY SCHOOLS.

It is my judgment that there would be a substantial increase in the efficiency of the Artillery School and the School of Submarine Defense if the heads of the departments of instruction were placed upon the same footing as the assistant professors at the Military Academy with respect to pay and allowances.

The officers who fill these positions are selected for their technical information and general ability, and they are charged with duties which are fully equal if not of superior importance to those of the assistant professors at the Military Academy, all of whom receive the pay of captains mounted. The hours devoted to instruction are in both schools much longer than at the Military Academy.

BOARDS FOR PREPARING ARTILLERY DRILL REGULATIONS.

A board of officers has been convened at Fort Monroe, Va., for the purpose of preparing drill regulations for the coast artillery. The board has determined the general principles of coast defense, and has prepared the manual of drill for all of the seacoast pieces.

A board of field-artillery officers is preparing drill regulations for the new rapid-fire field gun. This board is now at Fort Riley, Kans., testing drills and regulation of fire, and is making satisfactory progress.

In both the coast artillery and field artillery the changes in drill and fire action amount, not to a modification, but as a rule to a complete change of methods heretofore existing. So entire a change in the drill and tactical use of artillery in both of its branches has never before been known in our Army, and the necessity for the thorough test of every exercise and maneuver delays the completion of these drill regulations for both branches of the artillery service.

ARTILLERY SCHOOL.

Forty-eight student officers entered the Artillery School in September, 1903, of whom 32 graduated and have received the diploma of the

school, 10 completed the course of instruction but failed to graduate, and 6 for various reasons failed to finish the course.

The School for Master Gunners for enlisted men is a part of the Artillery School. Soldiers are removed for one year from their companies to take this course. A graduate of the Master Gunners' School is qualified for the following very important artillery work:

Surveying and triangulation to determine the length and azimuth of horizontal base lines.

Orienting guns and determining the height of gun trunnions and position finders above mean low tide.

Construction of various harbor charts for use by battle, fire, and battery commanders.

Construction of difference charts.

Construction of topographical maps of the country and coast of the artillery district with a view of providing proper defense against landing parties and land attacks on the forts.

Computations and blue prints.

Experience has shown that it is impossible to keep men of such attainments in the coast artillery for the pay given to other men in the companies.

Legislation should be asked to provide for graduates of the School for Master Gunners, sufficient rank and pay to induce them to remain in the service.

A master gunner should receive, in addition to his present pay and allowances, \$15 per month.

Commandants of the Artillery School have for many years urgently recommended the construction of a fireproof library. The collection of professional books and other literature at the Artillery School is very valuable and can not be duplicated elsewhere. The present library is a light frame structure inadequate in size and very unsuitable for the purpose used. In case of fire the building with all of its books would probably be consumed in a few minutes and be a total loss.

The clerical administration of the school is much embarrassed for want of sufficient force. The Inspector-General, as the result of a recent inspection, has recommended an additional civilian clerk.

The commandant recommends that Congress should by appropriate legislation eliminate from the service those artillery officers who demonstrate after a course of instruction at the Artillery School that they are unfitted for the artillery service.

It is recognized that an officer may fail at the Artillery School and yet be acceptable to the artillery service, but some fail so conspicuously, either from lack of aptitude or inclination to study, that it is hopeless to expect they will ever be efficient artillery officers. These barren fig trees should be cut down by legislation.

SCHOOL OF SUBMARINE DEFENSE.

Ten artillery captains entered this school in October, 1903, to take the course of instruction, and all have graduated.

Twenty enlisted men have successfully completed the course in the School for Electrician Sergeants, and have been appointed to that grade.

The usefulness of the School of Submarine Defense is unfortunately limited for lack of quarters to accommodate more student officers. The school has sufficient plant and instructors for 20 student officers. It would be of great advantage to the artillery service if quarters were

constructed for 10 more officers, and this action would enable the capacity of the school to be doubled. As by the act of February 2, 1901, the submarine defense of the country was turned over to the artillery, it is very desirable that the number of annual graduates of artillery officers from this school should be increased.

It is very important that a complete power and electrical plant should be installed at Fort Totten for the instruction of officers and noncommissioned officers. The best types of installation are the only ones that should be employed at our technical schools.

ARTILLERY BANDS.

Each regiment of cavalry or infantry has its band, authorized by law. The artillery has now an organization equivalent to 13 regiments, but only 10 bands are allowed. This is an unfair discrimination against the artillery, which should be corrected by legislation.

Many coast artillery stations are on islands; as a rule they are less desirable than the cavalry or infantry stations of the country, and it would no doubt add much to the general content of the artillery soldier if he has his fair share of bands.

BOATS FOR ARTILLERY PURPOSES.

Modern coast artillery requires many adjuncts and accessories which are indispensable to its effective use. Of such adjuncts among the most necessary are boats to be used exclusively for artillery instruction and duties.

Boat transportation is needed for the following purposes:

1. Vessel tracking during artillery drill.
2. Towing targets for artillery practice.
3. Practice at night with searchlights in locating vessels and subsequent vessel tracking.
4. Towing targets for subcaliber practice.
5. Transporting, when necessary, observing details to the secondary stations of horizontal base lines.
6. To assist in planting torpedoes, and in submarine mine instruction.
7. To carry the artillery district commander on semimonthly and other visits of inspection to his posts.
8. To carry members of the artillery district staff to the posts of the district in the execution of their duties.
9. To carry post commanders and their staff to their garrisoned subposts.
10. To carry artillery district commanders on visits of ceremony to our own and to foreign men-of-war.

This enumeration is convincing of the importance of securing the necessary boat transportation for the exclusive purpose of increasing artillery efficiency.

To have effective artillery target practice the range section should be exercised daily in vessel tracking; there should be frequent subcaliber practice at towed targets, and the instruction should finally culminate in service practice at towed targets. To carry out this scheme it is necessary that there should be boats for the exclusive use of the artillery during the period of artillery instruction. It is expensive to make and keep coast artillery efficient, but it will cost much more in the end if the personnel is left inefficient from want of proper training, which depends upon the conditions I have named.

It is evident that without such boat transportation coast artillery can not hope to become efficient. The records of artillery target practice confirm this statement, the highest scores being made at the posts which had the best facilities for vessel tracking.

The Chief of Artillery is gratified in being able to announce that, thanks to the cooperation of the Quartermaster-General, fair progress is being made in securing boat transportation for the exclusive use of the artillery. Through the energy and foresight of General Randolph, late Chief of Artillery, and of Major Murray, commandant of the School of Submarine Defense, four boats known as "torpedo planters" have been specially designed for submarine work, constructed, and are now in commission. These boats, as their name indicates, will be employed in the harbors of the Atlantic and Gulf coasts in time of peace in submarine mine instruction and in time of war in laying the mines.

An additional torpedo planter should be constructed for use in the harbors of the Pacific coast.

CONCLUSION.

The maintenance of an army in the United States is the insurance paid to secure peace, and the best security for peace is to keep the Army always prepared for the contingency of war. My official concern and responsibility is limited to the preparedness of the artillery.

What is its condition with respect to preparedness for immediate service? We are in a transition state so far as our field artillery material is concerned. Excellent progress is being made in the fabrication of rapid-fire field guns and their carriages of the models lately adopted. It is understood that new designs have been adopted for our siege guns and their mounts, which will make them much more effective. Thus the field artillery's present condition, so far as concerns material, appears fairly satisfactory.

In earlier parts of this report I have shown that the field artillery is not tactically sufficient for the cavalry and infantry of our permanent establishment; that it has not a proper organization; and also that provision is not made for sufficient officers in the different grades even for the present force.

It is much to be regretted that a more unfavorable statement must be made of our coast artillery, which constitutes our first and most important line of defense against foreign invasion. We have not one-half of the trained personnel required to man the armament already mounted. At no post have we a complete installation of the approved position-finding equipment and accessories which is absolutely required to obtain the most effective work from the guns.

We are far from having a sufficient submarine-mining equipment for either home or insular harbor defense, and practically we have no instructed personnel for its care and operation.

It is very important in the interests of artillery efficiency that the examination for the promotion of artillery officers should be extended to include all grades.

This report shows by a very conservative statement of facts the defects and deficiencies of our artillery. It is for Congress in its wisdom to apply by appropriate legislation the remedies.

Very respectfully,

J. P. STORY,
Brigadier-General, Chief of Artillery.

THE CHIEF OF STAFF, U. S. ARMY,
Washington, D. C.

**REPORT OF THE BOARD OF ORDNANCE AND
FORTIFICATION.**

REPORT OF THE BOARD OF ORDNANCE AND FORTIFICATION.

WAR DEPARTMENT,
Washington, October 6, 1904.

The SECRETARY OF WAR.

SIR: Under the provisions of the act approved February 24, 1891, the Board of Ordnance and Fortification has the honor to submit, for transmission to Congress, its fourteenth annual report, covering the fiscal year from July 1, 1903, to June 30, 1904.

CHANGES IN PERSONNEL.

Since the last report there have been several changes in the personnel of the Board. Maj. E. M. Weaver, Artillery Corps, was detailed as a member by Special Orders No. 66, War Department, October 31, 1903, vice Lieut. Col. Sedgwick Pratt, Artillery Corps. Maj. Gen. Wallace F. Randolph, Chief of Artillery, was retired from active service January 23, 1904, and Brig. Gen. J. P. Story became a member of the Board by virtue of his appointment as Chief of Artillery. By Special Orders No. 28, War Department, February 3, 1904, the Board was reorganized with the following-named members, and has since remained unchanged in personnel, viz:

Maj. Gen. George L. Gillespie, Assistant Chief of Staff; Brig. Gen. William Crozier, Chief of Ordnance; Brig. Gen. John P. Story, Chief of Artillery; Brig. Gen. Alexander Mackenzie, Chief of Engineers; Lieut. Col. Ramsay D. Potts, Artillery Corps; Maj. Erasmus M. Weaver, Artillery Corps; Gen. Thos. J. Henderson, civilian member; Capt. Tracy C. Dickson, Ordnance Department, recorder.

LEGISLATION.

The only special legislation affecting the Board is contained in the fortifications appropriations act approved April 21, 1904, making appropriation for continuing the work of the Board, as follows:

To enable the Board to make all needful and proper purchases, experiments, and tests to ascertain, with a view to their utilization by the Government, the most effective guns, small arms, cartridges, projectiles, fuses, explosives, torpedoes, armor plates, and other implements and engines of war, and to purchase or cause to be manufactured, under authority of the Secretary of War, such guns, carriages, armor

plates, and other war material as may, in the judgment of the Board, be necessary in the proper discharge of the duty devolved upon it by the act approved September twenty-second, eighteen hundred and eighty-eight; to pay the salary of the civilian member of the Board of Ordnance and Fortification provided by the act of February twenty-fourth, eighteen hundred and ninety-one, and for the necessary traveling expenses of said member when traveling on duty as contemplated in said act; for the payment of the necessary expenses of the Board, including a per diem allowance to each officer detailed to serve thereon when employed on duty away from his permanent station, of two dollars and fifty cents a day; and for the test of experimental guns, carriages, and other devices procured in accordance with the recommendation of the Board of Ordnance and Fortification, one hundred thousand dollars, the expenditure of which shall be made by the several bureaus of the War Department heretofore having jurisdiction of the same, or by the Board itself, as the Secretary of War may direct: *Provided*, That before any money shall be expended in the construction or test of any gun, gun carriage, ammunition, or implements under the supervision of the said Board, the Board shall be satisfied, after due inquiry, that the Government of the United States has a lawful right to use the inventions involved in the construction of such gun, gun carriage, ammunition, or implements, or that the construction or test is made at the request of a person either having such lawful right or authorized to convey the same to the Government.

GENERAL OPERATIONS.

During the year many tests have been made, under the direction of the Board, of new material and of offensive and defensive appliances, both for seacoast defense and for the service of troops in the field. The principal work connected with the seacoast defense has included tests to determine the penetrating and biting angles of capped and uncapped rifle projectiles when fired against deck armor, and much valuable and instructive data have been obtained. The test made with a 12-inch shell charged with explosive "D" and fired with a nondelay-action fuse demonstrated the desirability of repeating the test against 7-inch armor. If 7-inch armor yields to this test, it will be desirable to make the same test against 12-inch armor.

In this same line of investigation may be mentioned the tests commenced for determining the relative value of capped and uncapped mortar shells when fired at striking angles of 50° and 75°.

The 6-pounder semi-automatic gun has been adopted for use in the coast defenses and allotments made for the purchase of several different designs of guns of this caliber, to determine by test the most desirable form of breech mechanism.

The principal work connected with the field service has included extensive tests with ammunition carts, conducted under service conditions, demonstrating the lack of effectiveness of this method of distributing ammunition to the firing line.

Experiments for the purpose of determining a satisfactory design of intrenching tool for use in place of the knife bayonet have been continued.

SUBJECTS CONSIDERED.

A large number of projects and suggestions have engaged the attention of the Board during the year. The majority of the devices suggested by inventors have not been deemed worthy of trial at the expense of the United States, but all have been carefully investigated with a view to utilizing everything of real value. A list of subjects considered will be found in Appendix B.

THE HUNDRED-GUN CONTRACT.

By the terms of the contract entered into November 7, 1891, between the Bethlehem Iron Company, now the Bethlehem Steel Company, and the Chief of Ordnance, the company agreed to deliver twenty-five 8-inch, fifty 10-inch, and twenty-five 12-inch guns for coast defense.

All the 8 and 10 inch guns have been delivered, and there remain but seven 12-inch guns to be completed. It is anticipated that delivery of the last of the seven guns will be made by August 1, 1905.

TESTS OF DECK ARMOR.

March 6, 1903, an allotment of \$20,000 was made for procuring armor plate, and to cover the costs of tests to determine at what angles of incidence projectiles of large caliber will "bite" and perforate the best quality of deck armor now being made. These experiments were proposed for the information of a board of officers which is engaged in revising the coast artillery drill regulations. The program adopted provides for firing at 4½-inch nickel-steel plates with 8, 10, and 12 inch capped A. P. projectiles at varying angles of impact, and ending by firing a 12-inch capped A. P. shell charged with high explosive at an angle less than the biting angle, to determine the effect of the explosive on the penetration. The program also provided, under certain conditions, for continuing the experiments with 3-inch plates. The program was modified on January 7, 1904, to repeat certain firings at 3-inch plates.

After the firing of the 12-inch shell charged with high explosive, the Board on May 5, 1904, requested the Chief of Ordnance to submit an estimate of cost of a 7-inch Krupp plate, to be fired at with a 12-inch A. P. shell charged with high explosive, and on June 2, 1904, made an allotment of \$6,000 to cover the cost of the latter test.

TEST OF CAPPED AND UNCAPPED MORTAR SHELL.

The artillery board at Fort Monroe having raised the question of the relative value of capped and uncapped shells in mortar fire, the Board requested the Chief of Ordnance to prepare a program to determine the relative value of the two projectiles.

On March 3, 1904, the Board made an allotment of \$20,881.20 to cover the cost of plates, powder, projectiles, backing, and repairs for carrying out the program adopted.

None of the material for this test had been delivered on June 30, 1904.

EXPERIMENTAL GUNS AND CARRIAGES.

The Brown 10-inch segmental-tube wire-wound gun.—This gun was built under an allotment of \$33,000 made by the Board September 15, 1896, and was completed in December, 1899, but owing to the delays on the part of the trustees of the Brown patents in designating a suitable powder, the preliminary firing tests of the gun were not begun until February, 1901. The first proof round with a pressure of 10,000 pounds developed a crack extending through the third chase hoop. As this hoop is a thin covering used to protect the wire from injury, it was not believed the defect had in any way weakened the gun, and on

March 6, in the presence of the Board, three additional rounds were fired, with pressures ranging from 15,700 to 26,900 pounds. It being evident from these and subsequent rounds that, with the special kind of powder determined upon, the required velocities could not be obtained, the Board on April 6, 1901, granted the request of the trustees to increase the chamber capacity of the gun. This alteration necessitated sending the gun to the shops of the manufacturer. When returned it was again mounted and firing tests renewed on October 28, 1901.

On the second round, with a charge of 175 pounds Du Pont smokeless powder for the 12-inch rifle and a recorded pressure of 51,550 pounds per square inch, the breech bushing, which was of cast steel and carried the breechblock and mechanism, was torn from the gun and blown backward several hundred feet. On October 31, 1901, the Board inspected the gun and found that, except as above indicated, it was uninjured. Permission was granted to remove the gun for repairs, with the understanding that the Government was to be put to no expense therefor.

August 12, 1902, the trustees again requested permission to further enlarge the chamber of the gun, and August 26 the Board granted this permission. In July, 1903, the gun was returned to the proving ground and mounted for continuation of test under a program of 100 rounds approved by the Board.

July 30, 1903, one shot was fired in the presence of the Board, with a charge of 100 pounds of smokeless powder. The breechblock was jammed by this shot and required considerable force to open it. Firings were continued from time to time until November, 1903, the breech mechanism continuously operating unsatisfactorily.

On November 4, 1903, the company requested permission, which was granted, to substitute a new breech mechanism, but the gun still remains at the proving ground in a disabled condition.

April 7, 1904, the company requested an additional allotment of \$10,000 to cover extraordinary expenses incurred in the manufacture of the gun, but the request was not approved.

Upon inquiry, the company reports, under date of July 20, 1904, that it has made arrangements with the Reading Iron Company to repair the mechanism, but as the latter company has but one lathe suitable for the purpose the repairs will be delayed until the 6-inch wire gun, for which the lathe is being used, is completed.

The Brown 6-inch segmental-tube wire-wound gun.—The act approved June 6, 1902, providing for fortifications and other works of defense, including the armament thereof, contained a provision that, in the discretion of the Secretary of War, a portion of the money appropriated could be used for the purchase of material for a limited number of steel-wire seacoast guns. The trustees of the Brown wire-gun patents made application to the Secretary of War to be permitted to furnish guns of their design under this clause.

The Secretary of War on July 21, 1902, referred to the Board for consideration and recommendation the question of whether or not it was advisable to adopt as a type the Brown segmental-tube wire-wound gun and to purchase or construct guns of that description for the service of the United States.

On August 7, 1902, the Board replied that "it is not at present prepared to recommend the Brown segmental-tube wire-wound gun as a

type for the service." The Board did, however, recommend, and the Secretary of War approved, an allotment of \$25,000 to procure one Brown 6-inch wire-wound rapid-fire gun with suitable mount, implements and accessories, and 500 rounds of ammunition. This allotment was, on December 4, 1902, increased \$16,000 upon the representations of the trustees as to the cost of manufacture, and the amount of ammunition to be furnished was reduced to 250 rounds. The aggregate amount allotted is therefore \$41,000.

The object of this purchase is to obtain a wire-wound gun of the latest design proposed by the Brown Wire Gun Company with a view to its test, and to determine the question whether or not other guns of the same design shall be procured as a part of the coast-defense system.

The gun and mount were completed and shipped to the proving ground at Sandy Hook on September 30, 1904.

The Crozier 6-inch wire-wound gun.—The Board at its meeting on September 10, 1903, made an allotment of \$11,000 for the construction of a wire-wound gun on the design of Gen. William Crozier, Chief of Ordnance. This gun differs in many respects from the Brown gun, the most noticeable difference being the absence of the segmental tube, which is one of the features of the Brown system, and the Board expects to test it in comparison with the gun of the same caliber built on the plans of the Brown Company. This gun is about 50 per cent completed.

On June 2, 1904, the Board made an allotment of \$16,537 to procure 250 rounds of ammunition for the test of the gun, and at the same time approved program for its test and that of the Brown 6-inch wire-wound gun.

The Bethlehem 6-inch rapid-fire gun and mount.—On January 3, 1901, the Board made an allotment of \$17,900 for the construction of a type 6-inch rapid-fire gun with pedestal mount, the design of the Bethlehem Steel Company. The gun is to be capable of being fired at least eight rounds in one minute with 2,500 foot-second velocity, and to give a muzzle velocity of 3,000 foot-seconds with a projectile weighing 100 pounds, without excessive pressures.

The ammunition for the proof-firing test will be furnished by the company without expense to the Government, and the equipment is not to be paid for unless it fulfills the specified requirements. Gun and mount are now at the Sandy Hook proving ground undergoing test.

The Bethlehem 5-inch gun on combination carriage.—On May 4, 1900, the Board made an allotment of \$14,000 for the construction of a 5-inch gun and carriage proposed by the Bethlehem Steel Company. The carriage is of a special type, intended to combine the characteristic features of both the disappearing and rapid-fire mounts. It is stipulated in the contract that before payment is made for the material it must pass such firing tests as may be prescribed by this Board. The contract was dated July 2, 1900, and the gun and carriage were to have been delivered ready for test not later than July 2, 1901. Owing to the experimental nature of the carriage, however, its completion has been greatly delayed. It was found necessary to replace the breechblock of the gun with one of a new design, and as the finished gun is required for balancing certain parts of the carriage, the completion of the carriage was thereby further delayed. The material is now at the Sandy Hook proving ground undergoing test.

Fifteen-pounder semi-automatic gun and mount.—March 3, 1904, the

Board made an allotment of \$10,000 for the construction of a 15-pounder semi-automatic gun and mount, to be made in accordance with designs submitted by the Chief of Ordnance. The allotment also covers the cost of 100 rounds of ammunition.

Gun and mount were about 50 per cent completed on June 30, 1904.

Six-pounder semi-automatic guns and mounts.—The Board at its meeting December 3, 1903, recommended the adoption of 6-pounder guns on pedestal mounts as a part of the coast defense armament, and, in order to determine the most effective guns and mounts, has made the following allotments for the purchase of 6-pounder semi-automatic guns of nickel steel, having a muzzle velocity of 3,000 feet per second, with pedestal mounts, viz, Driggs-Seabury Ordnance Corporation, December 3, 1903, \$3,600. American and British Manufacturing Company, May 5, 1904, \$3,500. Benet-Hotchkiss, December 3, 1903, \$3,200; January 7, 1904, \$590; March 3, 1904, \$80. United States Rapid Fire Gun and Power Company, April 7, 1904, \$3,398.76; June 2, 1904, \$483.38.

To provide for the test of these guns the Board on May 5, 1904, made an allotment of \$16,000 to cover all expenses incident to test, including the necessary ammunition.

AUTOMATIC GUNS AND MOUNTS.

Vickers-Maxim 1-pounder automatic gun.—April 4, 1900, the Board made an allotment of \$8,300 for the purchase of a Vickers-Maxim 1-pounder automatic gun and carriage and 2,000 rounds of ammunition. The material was tested in the fall of 1902, 966 rounds being fired under the program adopted. No action has been taken on this material pending completion of test of the McClean gun.

Hotchkiss 1-pounder automatic gun.—On June 8, 1900, the Board made an allotment of \$4,052.50 to purchase from the American Ordnance Company a Hotchkiss 1-pounder automatic gun and carriage, and on October 4, 1900, an additional allotment of \$1,300 to procure the ammunition necessary for test of the gun.

The gun was delivered at the proving ground in November, 1900, and on March 6, 1901, was fired in the presence of the Board. After firing 186 rounds of the program, an offer was made by the representatives of the Hotchkiss Company to exchange it for a gun and mount of the latest design without expense to the Government. The offer was accepted on September 10, 1903, and the material was delivered.

The test of the gun and mount has been completed, 714 rounds having been fired with the new gun.

McClean 1-pounder automatic gun.—In April and June, 1899, the Board made allotments aggregating \$884.28 to reimburse the Navy Department for a 1-pounder rifle barrel and 500 rounds of ammunition furnished S. N. McClean, who had submitted to the Board a 1-pounder automatic gun and mount. On January 26, 1900, the Board witnessed a preliminary firing test of the gun, and on May 4, 1900, made an allotment of \$3,000 for the purchase of 1,000 rounds of ammunition and to cover other incidental expenses of a thorough firing test of the equipment as soon as completed. In August, 1900, 500 rounds of ammunition was furnished Mr. McClean for use in the experimental development of his gun and the cost charged to the allotment of \$3,000.

May 28, 1903, the Board witnessed an exhibition test of this gun at the Sandy Hook proving ground, at which time the Vickers-Maxim and Hotchkiss guns were also fired. The gun was then removed for repairs and was only returned to the proving ground in March of this year, when its test was resumed under a program approved by the Board.

Six hundred and seventy rounds were fired during this part of the test, but as the elevating and traversing mechanisms were unsatisfactory in design, permission was granted on April 7, 1904, for the withdrawal of the material for the purpose of remedying the defects.

A supplemental program for completing the test of the gun was approved on June 2, 1904. The gun was returned to the proving ground in June, but as the ammunition furnished by Mr. McClean was not suitable, further test was postponed.

Vickers-Maxim mounts for 1-pounder automatic gun.—On December 4, 1902, the Board made an allotment of \$4,311.39 to procure one 37 mm. automatic gun with mountain outfit, spare mechanism, parts and tools, and one field equipment for mule transport. A subsequent allotment of \$350 was made on February 5, 1903, for pack saddles, and on February 4, 1904, an allotment of \$1,017.87 was made for test of the material.

The opinion of the artillery committee and of the Chief of Ordnance after tests was that the equipment is not equal to the 75 mm. mountain gun as a mountain outfit, but that it is valuable at seacoast forts on account of its mobility and destructive fire.

A galloping carriage for use with the 37 mm. gun, for which an allotment of \$1,400 was made June 20, 1903, was tested at the same time, but was not as satisfactory as the mountain carriage.

Recoil controlling device.—In the development of his automatic gun Mr. McClean had devised a recoil checking device, and on January 30, 1900, at his request, the Board made an allotment of \$1,000 to cover the construction and tests of a recoil checking device to be attached to the muzzle of one of the service 3.2-inch field guns which was furnished him for the purpose. So far as the Board is informed, no progress has been made during the year in this direction.

CARRIAGES FOR LARGE-CALIBER GUNS.

Disappearing carriage for 16-inch B. L. rifle.—At its meeting December 3, 1903, the Board considered report of a board of Ordnance officers convened by direction of the Secretary of War for the purpose of considering, under special instructions from the Chief of Ordnance, the subject of a carriage for the 16-inch B. L. rifle, which report was referred to this Board by the Secretary of War "for an expression of its views as to the desirability of constructing a disappearing carriage for the 16-inch gun of the type of those now in service."

The Board of Ordnance and Fortification concurred in the opinion of the board of Ordnance officers and recommended construction of a carriage of the service type. This recommendation was approved by the Secretary of War.

January 5, 1904, the Chief of Ordnance recommended an allotment of \$90,000 for plans, construction, and test of a carriage of the type proposed. The Board was of opinion that such a carriage was not, properly speaking, an experimental one and did not make an allotment

of its funds, but recommended instead that an estimate be submitted to Congress for the necessary appropriation.

The Emery 12-inch elevating carriage.—The construction of this carriage was authorized by a special act of Congress appropriating \$130,000 for the purpose in February, 1893, and a contract was entered into in March of that year with Mr. A. H. Emery, though the actual work of construction was not commenced until 1896, when, by act of June 6, an additional appropriation of \$10,000 was made for a loading apparatus for the carriage, and the inventor was relieved of the obligation of giving bond for the return of any money paid him should the carriage not prove to be successful. By act of May 25, 1900, the sum of \$40,000 was added to the contract price of the carriage, and by act of March 3, 1903, the further sum of \$40,000 was appropriated to enable Mr. Emery "to complete and erect the 12-inch carriage."

The total amount appropriated for this carriage and appurtenances is therefore \$220,000, of which \$135,656.98 has been paid. According to Mr. Emery's several reports there have been completed 10,971 parts of the carriage of an aggregate weight of 419,457 pounds.

The fortifications appropriations act approved April 21, 1904, contained the following provision:

To enable A. H. Emery to proceed promptly in the work of building and erecting the twelve-inch disappearing carriage and its loading apparatus being made by him for the Government it is hereby provided that the Secretary of War may, in his discretion, advance the said Emery, at any time or times which he thinks best, any part of the eighty-four thousand three hundred and forty-three dollars and two cents, balance of appropriations now available for completing the construction, erecting, and testing of the said twelve-inch carriage and its foundations and loading apparatus, and making the preliminary tests thereof: *Provided also*, That the Secretary of War is, in his discretion, hereby authorized to close the contract with said Emery, under which he is now making this twelve-inch carriage and its loading apparatus, by relieving him from all further work thereon and contracting with him for either an eight or ten inch disappearing carriage to be furnished by him in place thereof, together with its foundations, erection, and preliminary tests by him ready for the proof tests by the Board; and to pay therefor to the said Emery the said balance of eighty-four thousand three hundred and forty-three dollars and two cents, balance of appropriations above mentioned, in such sums and at such times as he shall, in his discretion, think best, to enable the said Emery promptly to construct and erect said carriage and its foundations and make the preliminary tests thereof, ready for its proof tests by the Board: *Provided further*, That in the judgment of the Secretary of War the eight or ten inch carriage hereby provided for can and will be completed within the sum of eighty-four thousand three hundred and forty-three dollars and two cents, heretofore appropriated.

In accordance with the provisions of the foregoing act all work on the 12-inch carriage was suspended, and on June 13, 1904, a contract was entered into by the Chief of Ordnance with Mr. Emery for one 10-inch disappearing carriage of his design.

SHIELDS FOR COAST-DEFENSE GUNS.

On March 5, 1902, the Board made an allotment of \$7,600 for the construction of a 4½-inch face-hardened steel shield of the design proposed by the Bethlehem Steel Company. It was at first intended to mount this shield on the 6-inch R. F. gun and carriage recently delivered by this company, but in order to avoid possible damage to the 6-inch gun, an allotment of \$258 was made on July 14, 1904, to enable a dummy gun to be used instead. The shield has been delivered at the Sandy Hook proving ground, and will be tested when the Ordnance Department design of shield mentioned below is delivered.

June 25, 1902, the Board made an allotment of \$10,640 for the manufacture of an experimental shield of a design submitted by the Ordnance Department to be tested under the same conditions as the Bethlehem shield. The shield is practically complete with exception of cutting the sight-hole.

TESTS TO DETERMINE LIMITING ANGLES OF TRAVERSE.

In August, 1903, the Board of Engineers recommended that tests be made to determine the limiting angles of traverse of coast-defense guns in respect to the blast effects on the personnel of adjacent emplacements.

After careful investigation to determine what data had already been obtained on the subject, the Board, on April 7, 1904, made an allotment of \$1,620.60 for the purchase of 10 rounds each of 3-inch, 5-inch, and 10-inch ammunition, for the purpose of conducting tests.

The Chief of Ordnance reports that 10 rounds of 5-inch ammunition have been shipped to Fort Howard, Md., and 5 rounds of 12-inch and 12 rounds of 10-inch ammunition to Fort Monroe for use in making the tests.

TESTS OF MORTAR-PIT SLOPES.

February 4, 1904, an allotment of \$1,200 was made to cover the cost of ammunition for firing three salvos from one mortar pit at Fort Moultrie, S. C., to test the stability of the concrete revetment, the experiment being made on the recommendation of the Chief of Engineers to furnish data for modifications required in the older mortar batteries.

The tests have been completed and the information desired obtained.

RANGE FINDERS.

Warner & Swasey Company.—March 3, 1904, the Board made an allotment of \$5,000 for the construction of a horizontal base range finder, of a design submitted by the Warner & Swasey Company. The instrument has a self-contained base line 25 feet in length. Tests made with a quarter-size model demonstrated its probable efficiency, but the allotment was made with the condition that no payment would be made for the instrument unless the results of its test are satisfactory to the Board. The instrument will probably be completed by November of this year.

Bethlehem Steel Company.—June 2, 1904, the Board made an allotment of \$5,550 for the purchase of a horizontal base range and position finder, of a design submitted by the Bethlehem Steel Company. In this instrument data is sent from the secondary to the primary station by telephone, telautograph, or otherwise. It is stipulated in the contract that the instrumental error due to lost motion must not exceed 0.001 of the range when tested with a base line not less than one-fourth of the range. The instrument is to be tested at Fort Monroe, and no payment therefor will be made unless the instrument is satisfactory to the Board.

Modified Lewis depression position finder.—May 1, 1902, the Board made an allotment of \$2,000 for the construction of a modified type of the Lewis depression range and position finder, certain mechanical defects having arisen in the continued use of the instrument in service.

The United States Rapid Fire Gun and Power Company, the manufacturers of the instrument, submitted drawings of the modified design, which were approved by the Board, but under date of February 13, 1904, the company expressed a wish to further modify the designs and requested an additional allotment of \$1,440 for completing a sample instrument. March 3, 1904, the company was requested to submit their latest design, upon receipt of which the Board would consider the question of making further allotment.

Rafferty range finders.—August 7, 1902, the Board made an allotment of \$2,500 for the purchase of one type A and two type B Rafferty depression range finders, for installation in Pensacola Harbor, for test during the tests of a system of fire control and direction conducted in that locality in 1903. The instruments were delivered too late for the purpose intended, and April 18, 1903, it was recommended that the three instruments be sent to Fort Monroe for test by the artillery board, which reported the instruments as unsatisfactory for adoption in the service.

Davis horizontal base range finder.—On July 6, 1900, the Board made an allotment of \$200 to cover the cost of test of the principles involved in the design of range finder proposed by Capt. H. C. Davis, Artillery Corps. Of this amount \$183 has been expended and Captain Davis reports that his other duties have been so pressing that he has been unable to complete the device.

Alteration of Weldon range finder.—November 5, 1903, the Board made an allotment of \$25 for the alteration of a Weldon range finder in accordance with a design submitted by Capt. S. E. Allen, Artillery Corps. This allotment was increased by \$21 on February 4, 1904, and the instrument sent to Fort Riley for test by the field artillery board. The report was adverse to the design submitted and its adoption was not recommended.

AMMUNITION CARTS.

Manning ammunition cart.—January 3, 1901, the Board made an allotment of \$1,500 for the construction of an ammunition cart, the design of Maj. W. C. Manning, U. S. Army. The cart was completed and exhibited to the Board and then sent to Fort Leavenworth for comparative test with the Allen ammunition cart and the ammunition feature of the Parker combination machine gun carriage and ammunition cart. The infantry board, which conducted the test, reported that, while the cart could be used for supplying ammunition to the firing line, it was not so well adapted to the purpose as a pack mule. On December 3, 1903, the Board recommended that the cart be not adopted.

Allen ammunition cart and water carrier.—An allotment of \$700 was made by the Board November 9, 1901, for the construction by Mr. H. F. L. Allen of two ammunition carts and water carriers, the device being designed to work singly or in pairs. The cart was inspected by the Board and sent to Fort Leavenworth for comparative test with the Manning and Parker devices.

The infantry board reported that, in its opinion, the cart was wholly impracticable and unworthy of further test, which opinion was confirmed by the Board on December 3, 1903.

Parker combination carriage for machine guns and ammunition cart.—February 8, 1902, the Board made an allotment of \$1,000 for

the construction of a sample carriage for machine guns, the design of Capt. John H. Parker, Twenty-eighth Infantry. This allotment was subsequently increased by two others of \$50 and \$100, respectively, for the purpose of providing a pack saddle. The ammunition-carrying feature of the cart had also been developed to such an extent that the device was sent to Fort Leavenworth for comparative test with the Manning and Allen carts.

The infantry board reported that, in its opinion, the supply of ammunition should be considered as a separate proposition apart from the use of the machine gun, and that the cart is not adapted to the supply of ammunition to the firing line.

December 3, 1903, the Board recommended that the Parker carriage be not adopted as an ammunition cart, and on April 7, 1904, the tripod mount having been approved by the Secretary of War for use with automatic machine guns issued to cavalry and infantry, the Board recommended test of the Parker cart in competition with that mount.

On January 7, 1904, the allotment of \$200, made October 1, 1903, for test of ammunition carts, was made available to put the Parker carriage in condition for further test. The cart has been altered and repaired in accordance with Captain Parker's suggestions and is now at Fort Leavenworth for the completion of its test.

AUTOMATIC PISTOLS.

Luger automatic pistol.—At its meeting, April 6, 1901, the Board made an allotment of \$15,000 for the purchase from the Deutsche Waffen- und Munitions-Fabriken of Berlin of 1,000 Luger automatic pistols of 7.65-millimeter caliber, for practical service test in the field.

The preliminary tests at Springfield Armory gave most satisfactory results, and the pistols were distributed to the cavalry and artillery with instructions to report on the arm. The reports varied so widely in the expression of opinion as to the merits of the arm that the Board, on April 3, 1903, made provision for exchanging 50 of the 7.65-millimeter pistols for 50 of 9 millimeters with $3\frac{1}{4}$ inch length of barrel.

When received, the pistols were sent to Fort Riley and, April 19, 1904, instructions were given by the Chief of Staff for test of the pistols by the cavalry and field artillery boards.

The field artillery board reported that up to June 30, 1904, only a preliminary test of the arm had been made. The cavalry board has completed the tests and submitted its report.

Colt's automatic pistol.—A new model of this arm having successfully passed the test at Springfield Armory, the Board at its meeting January 11, 1902, made an allotment of \$4,000 for the purchase of 200 of the latest model. These pistols were distributed for practical test and report.

The reports received have been filed to await conclusion of the tests of the Luger pistol.

INTRENCHING TOOLS.

Experiments for the purpose of obtaining a satisfactory intrenching tool as a substitute for the knife bayonet for hasty intrenchments have been continued, but so far no suitable design has been submitted.

Babcock intrenching tool.—July 30, 1903, an allotment of \$250 was made, increased by \$65.67 on September 10, for the manufacture for

test of 72 spade hatchets, an intrenching tool designed by Col. J. B. Babcock, U. S. Army.

A number of these were issued to the Engineer School of Application at Washington Barracks and to Fort Leavenworth, Kans., for practical test by the infantry board. The latter board reports that the tool is good for intrenching purposes, but that it is not prepared to recommend its adoption without further tests in competition with other tools. No reports have been received from the Engineer School.

ARTILLERY DEVICES.

Phillips replotter boards.—April 18, 1901, the Board made an allotment of \$5,000 for the purchase of 50 replotter boards of the design of Capt. C. L. Phillips, Artillery Corps, which were issued to coast artillery forts for test and report. The boards were found to be less satisfactory than other designs subsequently adopted.

Rafferty relocater.—April 18, 1903, Capt. W. C. Rafferty, Artillery Corps, appeared before the Board and exhibited a relocater of his design. The instrument was sent to Fort Pickens, Fla., for competitive test with the plotting board designed by Maj. G. N. Whistler, Artillery Corps. As the Rafferty device was not found upon test to be superior it has not been recommended for adoption.

Device for continuous laying of guns.—November 5, 1903, the Board made an allotment of \$250 for the construction and test of a device designed by Capt. F. K. Fergusson, Artillery Corps, for securing continuous laying of guns in elevation. The instrument was about 50 per cent completed on June 30, 1904, but as it was found to cost more than the original estimate, on August 11 an additional allotment of \$300 was made for its completion.

Hubbard semiautomatic sight.—August 7, 1903, the Board made an allotment of \$150 for the construction of a semiautomatic sight of the design submitted by Capts. E. W. Hubbard and S. C. Vestal, Artillery Corps.

The sight was tested at Fort Monroe and, October 1, 1903, the Board concurred in the opinion of the artillery board that neither the present sight nor one involving the same principles should be adopted for service.

Davis elevating scale.—July 30, 1903, the Board made an allotment of \$100 for the construction of an elevating scale for disappearing carriages of the design submitted by Capt. H. C. Davis, Artillery Corps. This device has been attached to a carriage at Fort Monroe and is now undergoing test.

THE LANGLEY AERODROME.

Early in the year 1898 a board composed of officers of the Army and Navy was appointed to examine the models and principles of the aerodrome devised by Dr. S. P. Langley, Secretary of the Smithsonian Institution, and to report whether or not, in its opinion, a large machine of this design could be built, and, if so, whether it would be of practical value.

The report of this board was referred to the Board of Ordnance and Fortification for action, and Doctor Langley was invited to appear before the Board and further explain the proposed construction.

In view of the great utility of such a device, if a practical success, the Board, on November 9, 1898, made an allotment of \$25,000 for the construction, development, and test of an aerodrome to be made under the direction of Doctor Langley, with the understanding that an additional allotment of the same amount would be made later. On December 18, 1899, the additional allotment of \$25,000 was made.

The construction of the machine was delayed by Doctor Langley's inability to procure a suitable motor, which he was finally obliged to design. The aerodrome was completed about July 15, 1903, and preparations for its test were made at a point in the Potomac River about 40 miles below Washington. Preliminary arrangements having been completed and tests made of a quarter-size model, the first attempt at actual flight with the man-carrying aerodrome was made on October 7, 1903.

On this occasion there were present on behalf of the Board, Maj. M. M. Macomb, Artillery Corps, and Mr. G. H. Powell, clerk of the Board.

Major Macomb in his report to the Board stated that—

The trial was unsuccessful because the front guy post caught in its support on the launching car and was not released in time to give free flight as was intended, but on the contrary, caused the front of the machine to be dragged downward, bending the guy post and making the machine plunge into the water about 50 yards in front of the house boat.

This accident necessitated the removal of the house boat to Washington for the more convenient repair of damages. The repairs having been completed, on December 8, 1903, another attempt at a trial was made; this time at the junction of the Anacostia and the Potomac rivers. Gen. W. F. Randolph and Major Macomb, members of the Board, and Mr. Powell were present. Major Macomb reported as follows:

The launching car was released at 4.45 p. m. * * * The car was set in motion and the propellers revolved rapidly, the engine working perfectly, but there was something wrong with the launching. The rear guy post seemed to drag, bringing the rudder down on the launching ways, and a crashing, rending sound, followed by the collapse of the rear wings, showed that the machine had been wrecked in the launching, just how it was impossible for me to see.

March 3, 1904, the Board stated that it was not "prepared to make an additional allotment at this time for continuing the work," whereupon Doctor Langley requested that arrangements be made for a distribution of the aerodrome material procured jointly from funds allotted by the Board and by the Smithsonian Institution. Doctor Langley was informed that all of the material would be left in his possession and available for any future work that he might be able to carry on in connection with the problem of mechanical flight.

MISCELLANEOUS.

Portable searchlight plant.—March 6, 1903, on the recommendation of the Chief of Engineers, the Board made an allotment of \$20,000 for the experimental development of an automobile gasoline or petroleum plant for operating searchlights. After thorough investigation the Board determined that the plans proposed were not feasible, and June 2, 1904, on recommendation of the Chief of Engineers, the allotment was revoked.

Searchlight reflector.—June 24, 1904, an allotment of \$800 was made for the purchase and test of one experimental truck and searchlight reflector upon the recommendation of the Board of Engineers.

Schulz blast meters.—May 5, 1904, the Board made an allotment of \$875 for the purchase of 25 blast meters of the design submitted by Capt. E. H. Schulz, Corps of Engineers, an instrument designed on hydropneumatic principles for measuring the effect of blast from sea-coast guns. The devices are to be used in connection with tests to determine limiting angles of traverse.

Subtarget gun machines.—April 18, 1903, the Board made an allotment of \$1,000 for the purchase of four subtarget gun machines, an instrument designed to aid in instruction in aiming small arms. One each of the devices was sent to Forts Riley, Sheridan, Leavenworth, and Camp George H. Thomas for practical trial.

Based on the reports received, certain modifications in the instrument were made on the suggestion of the Board, and on May 5, 1904, an allotment of \$1,000 was made for the purchase of four machines of the new design. These have been received and sent to Forts Myer and Clark and to Plattsburg Barracks and Vancouver Barracks for further test.

Meteorit.—April 7, 1904, the Board made an allotment of \$225 for the purchase of a quantity of meteorit, a new compound of aluminum, and its manufacture into bits, canteens, cups, and meat cans for service test. The Chief of Ordnance reports that the material has been ordered but had not been received on June 30, 1904.

Schou smoke compound.—February 5, 1903, the Board considered a formula submitted by C. V. Schou for making a smoke-producing compound. The Chief of Ordnance was requested to have prepared twenty-five 3-inch shrapnel charged with the Schou mixture for comparative test with a like number of shells charged with the service compound, in order that the relative value of the two might be determined. The Chief of Ordnance reports that no tests had been made up to June 30, 1904.

Batson-Sawtelle road level.—November 17, 1896, the Board made an allotment of \$200 for the purchase of a road level, the design of Captains Batson and Sawtelle of the Army. Captain Sawtelle reported August 25, 1902, that because of litigation relative to the patent the device was not further developed than when first proposed. A letter was addressed to Captain Sawtelle asking what progress had been made during the past year on his road level, to which he replied, under date of May 27, 1904, that nothing had been done toward development of the device. July 15, 1904, the Board recommended revocation of the allotment, which was approved by the Secretary of War.

Bore sight, Ordnance design.—The Board made several allotments aggregating \$500 for the construction of a telescopic bore sight for use in orienting guns. The sight was tested at the Sandy Hook proving ground, and December 3, 1903, the Board concurred in the conclusion of the ordnance board as to the unsuitability of the design for adoption.

Lanz canteen.—August 30, 1901, the Board accepted the offer of the Lanz Manufacturing Company to furnish 100 of the Lanz canteens without expense to the United States for test. The canteens were distributed to troops in the Philippines for test. The reports received were generally unfavorable to this canteen as compared with the

service article and on October 1, 1903, the Board recommended that it be not adopted.

Kent vented muzzle for small arms.—On March 3, 1904, the Board made an allotment of \$25 for the purpose of testing a vented muzzle for small arms, designed by Perry E. Kent. A rifle barrel was furnished Mr. Kent for venting, it having previously been tested for accuracy and velocity. Upon return of the barrel, the tests were repeated at Springfield Armory, with the result that every target made with the vented muzzle was inferior in accuracy to any made before venting. Adoption of the device was not recommended.

Isham recoil spade.—October 16, 1902, the Board made an allotment of \$250 for construction of a recoil device for field guns, the design of Mr. W. S. Isham. July 30, 1903, an additional allotment of \$147.87 was made for the same purpose.

The device was tested in the spring of 1903 and as a result the Board on May 28 made a further allotment of \$50 to procure a somewhat wider and heavier spade to be attached to the same device. So far as the Board is informed, no further action has been taken, though Mr. Isham reports, under date of August 2, 1904, that he intends at an early date to proceed with further consideration of the device.

Powell timing devices.—April 18, 1903, the Board made an allotment of \$800 for the manufacture of four timing devices of design submitted by G. H. Powell. The four devices having been practically completed, the Board on May 5, 1904, directed that a partial payment of 70 per cent be made to enable them to be completed.

Thompson mechanical distance fuse.—July 30, 1903, the Board made an allotment of \$150 to cover cost of ten mechanical distance fuses for test, the design of Mr. J. C. Thompson, at the same time making a further allotment of \$10 for altering ten cast-iron shells to fit the fuses. As tests showed the fuses to be very uncertain in action and the mechanism delicate and liable to injury, its adoption was not recommended.

Shee malleable-iron projectiles.—In June, 1902, Mr. Parke E. Shee in a letter to the Board stated that he had discovered a process of hardening malleable iron whereby it became suitable for the manufacture of armor-piercing projectiles. Mr. Shee was requested to furnish five 3-inch projectiles for test, which he did in the summer of 1903. September 10, 1903, an allotment of \$700 was made for banding the projectiles and procuring armor plate for test. Three projectiles were fired in October, 1903, two of which burst on leaving the gun. The opinion of the Board was that, while the projectiles were very hard, they did not possess sufficient toughness to render them of any value in the service.

RECOMMENDATIONS.

At its meeting December 3, 1903, the Board, in view of the pressing necessity for rapid-fire guns of intermediate caliber for coast defense, recommended that special estimates be submitted to Congress for the following guns and mounts, and for such emplacements and sites as may be required therefor, viz: 200 semi-automatic, high velocity, 6-pounder guns on pedestal mounts; 200 semi-automatic guns of a caliber large enough to fire effective shrapnel, to be mounted on long recoil, broad-tired field carriages, with limbers; 200 automatic

1-pounder guns, mounted on broad-tired mountain carriages; 200 automatic machine guns, caliber .30, on combined tripod and wheeled mount.

The Board recommends that this subject have further consideration and that estimates be submitted to Congress for procuring the several classes of guns enumerated above, with the exception of the automatic 1-pounder, which has not proved entirely satisfactory upon test and which should be further tested before provision is made for its final adoption.

The Board renews its former recommendations that appropriations by Congress should be sufficient in amount to provide a reserve supply of ammunition of at least 100 rounds for each large caliber gun and mortar, and at least 250 rounds for each rapid-fire gun, as soon as mounted, and without an adequate supply of ammunition, it is needless to say, the armament of the coast defenses is useless.

In addition to the above enumerated supply of reserve ammunition, there should be provided an ample allowance of ammunition for the annual target practice. A sufficient allowance for subcaliber and machine-gun practice should be continued.

Another of the most important features of the coast defense has not been adequately provided for, and this is the installation of a proper fire-control system at each coast artillery fort. Ample provision should be made for the purchase of range finders and other instruments for fire control, the installation of additional searchlights, and the necessary cable for conducting the electric power to the various parts of the fortifications and furnishing the essential lines of communication. Each battery of heavy-caliber guns should have its position-finding system installed as soon as the guns are mounted. It is the best known means by which accurate artillery fire can be secured for the usual battle ranges, and the Board is of the opinion that, in the present state of the coast defense, money can be more advantageously expended for fire control than for other permanent installations, since it is more desirable to increase the effectiveness of existing than to install new armament.

ESTIMATES FOR THE COMING YEAR.

In order to carry on the work of the Board for the fiscal year ending June 30, 1906, an estimate of \$50,000 has been submitted to the Secretary of War for transmission to Congress, and it is recommended that the appropriation be made in a single amount, as heretofore.

This is a reduction of \$50,000 in the estimate submitted and amount appropriated for the present fiscal year, and is so made as the Board is of opinion that, with the amount estimated for and the funds already available, it will be able to carry on its experimental work without interruption.

FINANCIAL STATEMENT.

In compliance with the act of February 24, 1891, which requires "a detailed statement of all contracts, allotments, and expenditures made by the Board," an exhibit, marked Appendix A, accompanies this report, giving a detailed statement of the allotments and expenditures from July 1, 1903, to June 30, 1904, the period covered by this report.

No contracts have been made by the Board during the fiscal year.

On July 1, 1903, the Board had on hand \$183,274.54, and by the act of April 21, 1904, \$100,000 was appropriated; to this is added the sum of \$58,181.14 revoked from prior allotments, making the total available \$346,455.68.

In the year past the Board has made allotments aggregating \$130,070.98, leaving a balance June 30, 1904, of \$216,384.70 for continuing the work of the Board, of which amount \$10,000 is available only for the purchase and test of movable submarine torpedoes.

G. L. GILLESPIE,

Major General, General Staff, President of the Board.

WILLIAM CROZIER,

Brigadier General, Chief of Ordnance.

J. P. STORY,

Brigadier General, Chief of Artillery.

A. MACKENZIE,

Brigadier General, Chief of Engineers.

R. D. POTTS,

Lieutenant Colonel, Artillery Corps.

E. M. WEAVER,

Major, Artillery Corps.

THOS. J. HENDERSON,

Civilian Member of the Board.

T. C. DICKSON,

Captain, Ordnance Department, Recorder.

APPENDIX A.

TABLE SHOWING ALLOTMENTS AND EXPENDITURES MADE BY THE BOARD OF ORDNANCE
AND FORTIFICATION FROM JULY 1, 1903, TO JUNE 30, 1904, INCLUDING STATEMENT
OF UNEXPENDED BALANCES.

Act of March 2, 1889.

Balance on hand July 1, 1903 ^a \$10,000.00

Acts of 1892 to 1903, inclusive.

Balance on hand July 1, 1903	\$178,274.54	
Act of April 21, 1904.....	100,000.00	
		\$278,274.54

Revocations of allotments under these acts:

1903.		
Aug. 6.	To offset overpayment, as per certificate of deposit No. 1225 by Treasurer of United States ..	1.00
Nov. 5.	Allotment of July 30, 1903, for attachment of cartridge indicator to new small arm	50.00
1904.		
Feb. 4.	Allotment of April 16, 1895, erecting platform for second pneumatic carriage	14,021.31
	Allotment of March 12, 1896, for type 5-inch gun with pillar mount and ammunition for test....	2,109.00
	Allotment of April 14, 1897, for hydrostatic tests of material for gun construction	470.00
	Allotment of October 20, 1897, for field guns and carriages for test	4,220.68
	Allotment March 16, 1898, for experiments in wireless telegraphy	200.00
	Allotment of December 20, 1899, for Dodge equipment carriers.....	600.00
	Allotment of October 5, 1900, for ammunition for test of Brown 10-inch gun.....	951.19
	Allotment of March 8, 1901, for test of mortar batteries	4,054.78
	Allotment of October 31, 1901, for dismantling Howell and pneumatic carriages.....	93.75
	Allotment of February 8, 1902, for repair of damages caused by bursting of Brown 10-inch wire gun	172.68
	Allotment of February 8, 1902, for Parker machine-gun carriage.....	126.00
	Allotment of March 6, 1902, for modification of 100 rifles on plan of Col. F. H. Phipps.....	81.51
	Allotment of April 5, 1902, for ammunition for test of Bofors 15 cm. gun.....	938.85
	Allotment of June 25, 1902, for test of steel plates.	1,260.00
	Allotment of June 25, 1902, for pay and expenses of record clerk	268.40
	Allotment of August 7, 1902, for Hughes safety device for target ranges	1,500.00

^a Available only for movable submarine torpedoes.

1904.

RECAPITULATION.

Balance on hand and appropriated during the year, general fund	\$278, 274. 54
Balance on hand, act of March 2, 1889	10, 000. 00
Allotments revoked	58, 181. 14
Total available	\$346, 455. 68
Allotments during the year	130, 070. 98
Available for allotment	216, 384. 70

APPENDIX B.

Summary of subjects considered.

Subject.	Submitted by—
System of fire control and direction.....	Chief of Artillery.
Intrenching tool.....	Col. J. B. Babcock.
Fuses.....	J. C. Thompson.
Elevating scale.....	Capt. H. C. Davis.
Magazine indicator for small arms.....	G. H. Powell.
Test of automatic 1-pounder guns.....	Board of Ordnance and Fortification.
Recoil spade, test of.....	Willard S. Isham.
Machine-gun carriage.....	Capt. J. H. Parker.
Program for test of 10-inch wire-wound gun.....	Brown Wire Gun Co.
Test of Brown 10-inch wire-wound gun.....	Board of Ordnance and Fortification.
Relocator, azimuth instrument, and range scale.....	Capt. W. C. Rafferty.
Tests of Luger pistol, report.....	Chief of Ordnance.
Device for automatic training of guns.....	Morgan Engineering Co.
Artillery correction device.....	Capt. E. W. Hubbard.
Metallic reflector for searchlights.....	Sergt. Tam C. McGregor.
Need of intrenching tool.....	Chief of Ordnance.
Grenfell system of sighting.....	Driggs-Seabury Ordnance Corporation
High explosive shell, new trial.....	Willard S. Isham.
Test of cemented and noncemented steel plates, report.....	Ordnance Board.
Brake for field artillery.....	S. Giuliano.
Torpedo.....	Alex. Frus.
Magazine rifle and bayonet.....	Benjamin F. Perry.
Device for eliminating recoil.....	S. Balla.
Cylindrical hollow projectile.....	J. K. Street.
Compound armor plate.....	G. Dittmar.
Field-gun carriage.....	Otto Grunwald.
Device to prevent man from falling from saddle.....	James Roseberry.
6-inch wire-wound gun.....	Chief of Ordnance.
Engineer equipment pouches.....	Chief of Engineers.
Malleable iron projectile.....	Park E. Shee.
Payment for plotting boards.....	Chief of Ordnance.
Hotchkiss 1-pounder gun, exchange.....	American and British Manufacturing Co.
Safety device for target ranges.....	Gen. R. P. Hughes.
Portable range finder.....	James Gordon Stewart.
Horizontal base range finder.....	Lieut. M. M. Cloud and M. F. Volkman.
Continuous reading range and azimuth indicator.....	Bethlehem Steel Co.
Test of Bofors 15-cm. gun.....	Chief of Ordnance.
Remodeled Lewis position finder.....	United States Rapid Fire Gun and Power Co.
Armored forts and turrets.....	H. L. Cole.
Fortification.....	Alfred J. Anderson.
Cartridge case for small arms.....	Frank Tusker.
Disappearing fence.....	I. B. Abraham.
Multiball cartridge.....	Aksel Malin.
Intrenching tool.....	Robert Henderson.
Electrical equipment, removal.....	Chief of Ordnance.
Test of ammunition carts.....	Board of Ordnance and Fortification.
Semi-automatic guns.....	Driggs-Seabury Ordnance Corporation.
Semi-automatic sight.....	Capt. E. W. Hubbard and Capt. S. C. Vestal.
Canteen.....	Lanz Manufacturing Co.
Small arm.....	John R. Hamilton.
Appliances for range finding.....	Henry Hess.
Langley aerodrome, report.....	G. H. Powell.
Tests of deck armor, report.....	Maj. M. M. Macomb.
Alteration Weldon range finder.....	Capt. S. E. Allen.
Device for continuous laying of guns.....	Capt. F. K. Fergusson.
Brown 10-inch wire gun, change of breech mechanism.....	Brown Wire Gun Co.
Shee projectiles, test, report.....	Committee of Board.
Mounts for 6-pounder guns.....	Chief of Engineers.
Aerodrome, report of tests.....	Dr. S. P. Langley.

454 REPORT OF BOARD OF ORDNANCE AND FORTIFICATION.

Summary of subjects considered—Continued.

Subject.	Submitted by—
Projectile with delay-action fuse.....	George Aylwin and Lucas Bunnell.
Projectiles.....	J. T. Brown and S. E. Ferris.
Gun-sling hook.....	A. V. Cushman, attorney.
Colt's automatic pistols, report.....	Officers in field.
Rapid-fire automatic and semi-automatic guns.....	Board of Ordnance and Fortification.
6-pounder semi-automatic gun.....	Driggs-Seabury Ordnance Corporation.
6-pounder semi-automatic gun.....	United States Ordnance Co.
Estimates for rapid-fire guns.....	Board of Ordnance and Fortification.
Allen ammunition cart, report.....	Infantry Board.
Parker ammunition cart.....	Do.
Manning ammunition cart.....	Do.
Disappearing carriage for 16-inch rifle.....	Chief of Ordnance.
Subtarget gun machine, report.....	Committee of Board.
Disappearing-gun carriage.....	Corporal Paul Borger.
Air ship.....	John A. Bower.
Bayonet fastening.....	Nederlandsche Fabrik van Oorlogs- material.
Nitroglycerin compound.....	G. Dittmar.
Fuse.....	Friedrich Bruck.
Fulminating compound.....	R. Fusnot.
Torpedo propulsion.....	Alex Frus.
Apparatus for destroying torpedoes.....	Wienand Houseman.
Aerial ordnance balloon.....	Col. F. P. Cobham.
Telescopic bore sight, report.....	Chief of Ordnance.
Test of machine guns.....	Board of Ordnance and Fortification.
Test of deck armor, change in program.....	Committee of Board.
Test of capped and uncapped mortar shell.....	Do.
Floating target for test of torpedo shell.....	Board of Ordnance and Fortification.
Link attachment for bits.....	W. A. Fowler.
Entrenching tool.....	E. R. Gehris.
Wireless telegraph apparatus.....	Col. F. P. Cobham.
Wireless control of dirigible torpedoes.....	Dudley H. Cohen.
Armor-plate forts.....	G. W. Billhimer.
Roller bearing.....	Burton D. Gibbs.
Luger pistols, tests, report.....	Springfield Armory.
Langley aerodrome, report.....	Maj. M. M. Macomb.
Automobile searchlight plant, report.....	Maj. W. L. Marshall.
Air ship.....	I. C. Duckworth, attorney for A. A. Kellogg.
Do.....	A. Barthelet.
Do.....	Carl Browne.
Do.....	A. V. Winegarden.
Do.....	John P. Le Fevre.
Do.....	Bela Bitskey.
Test of Vickers-Maxim 1-pounder gun.....	Committee of Board.
Test of galloping carriage.....	Do.
Parker ammunition cart, report.....	Col. J. Rush Lincoln.
Floating platform for balloon.....	Charles Fleese.
Fire damp as an explosive.....	A. O'Donnell.
Armored searchlights.....	W. O. Webber.
Multiplying motive power.....	Olney Thornley.
Ballistic board.....	Capt. W. C. Rafferty.
Test of Vickers-Maxim 1-pounder gun, cost.....	Chief of Ordnance.
Test of mortar-pit slopes.....	Capt. G. P. Howell.
Automatic guns and recoil devices.....	S. N. McClean.
Vented muzzle for small arms.....	Perry E. Kent.
Meteorite.....	Von der Porter, Saucis & Co.
Grooved projectiles.....	William A. Coe.
New war game.....	Count Mac Gregor.
Projectiles.....	Albert Wakefield.
Globular floating battery.....	Anson Phelps Stokes.
Spring-operated gun.....	Louis A. Leavell.
Wire-cutting projectile.....	William F. Hitchcock.
Air ship.....	William Reiferscheid.
15-pounder semi-automatic gun and mount.....	Chief of Ordnance.
Disappearing carriage for 16-inch rifle, requests allotment.....	Do.
Buffington disappearing carriage for 16-inch rifle, review of report on.....	Gen. R. P. Buffington.
Detail of guard for house boat.....	Dr. S. P. Langley.
Protest relative to inventions.....	Willard S. Isham.
Do.....	Louis Gathmann.
Percussion fuse.....	David J. Cartwright.
Telemeter.....	E. von Paschwitz.
Horizontal base-range finder.....	Warner & Swasey Co.
Searchlight system.....	Capt. E. H. Schulz.
Aerodrome experiments, status.....	Dr. S. P. Langley.
Deck armor, report.....	Committee of Board.
Plotting ruler.....	Capt. E. W. Hubbard.
Gunnery' corrector.....	Do.
Armored motor car.....	Charles F. Shedd.
Torpedo.....	E. E. Resor.
Throwing nitroglycerin.....	C. O. Prowse.
Fort.....	Charles Wesley Pratt.

REPORT OF BOARD OF ORDNANCE AND FORTIFICATION. 455

Summary of subjects considered—Continued.

Subject.	Submitted by—
Repeating weapon	Franz Straka.
Traction engine	William G. Clark.
Steam boiler	A. R. Coleman.
Shrapnel shell	Theo Eckard.
"Spheroid lancet" shot	R. P. McMahan.
Air ship	Roman Krautschneider.
Do	F. F. Bower.
Do	Bela Bitskey.
Do	John C. Harloff.
Do	F. J. Bloom.
Do	T. H. Paessler.
Do	H. Faehrmann.
McClellan Arms Co., report	Capt. T. C. Dickson.
Searchlight plant, report	Maj. W. L. Marshall.
6-pounder gun and mount	United States Rapid-Fire Gun and Power Co.
Test of limiting angles of traverse	Board of Engineers.
Competitive tests of Parker machine-gun mount, program	Artillery committee.
Subtarget gun machine	H. C. Wilson.
10-inch wire gun, request additional allotment	Brown Wire Gun Co.
Slide jacket for 6-inch gun	Do.
1-pounder automatic gun, change in mount	S. N. McClellan.
3-pounder gun and mount, requests allotment for	Do.
Air ship	S. D. Mott.
Distribution of aerodrome material	Dr. S. P. Langley.
Illuminating compound	F. Lowenstein.
Adoption of intrenching tool	Gen. Tasker H. Bliss.
Forbes range finder	Military Information Division.
Pintle hook for artillery	M. Koehnitzky.
Field gun	C. M. Nielsen.
Rotary engine	J. E. Hartwell.
Small arm	Angel Chiesanovas.
Camera obscura	Will F. Gray.
Torpedo defense	William E. Budd.
Air ship	D. M. Elder.
Do	J. L. Spence.
Range finder	B. R. H. Taylor.
Armored horse car	A. R. Thurlow.
Laminated armor plate	T. Myrensen.
Air ship	Lewis C. Boswell.
6-pounder semi-automatic gun and mount	American and British Manufacturing Co.
Ammunition for test of 6-pounder guns	Chief of Ordnance.
Blast meters	Capt. E. H. Schulz.
Timing devices, payment for	G. H. Powell.
Artillery projectiles, kinds	Capt. C. D. Parkhurst.
Photographic apparatus	G. H. Powell.
Contract for 6-inch gun, change	Bethlehem Steel Co.
Tests of deck armor, report	Artillery committee.
Works of Bethlehem Steel Co., report	Do.
Air ship	W. S. Piety.
Automatic pistol	Small Arms and Machine Factory Co.
Sight for small arms	S. S. Shrapnel.
Indirect sighting	W. D. Bowman.
Gas engine	A. R. Coleman.
Trench digging machine	Walter Cole.
Dirigible torpedo	Herman Cole.
Portable bridge	Henri Magnin.
Instrument for measuring depth of ocean	W. J. Woods.
Air ship	Alonzo L. d'Spain.
Luger pistol, tests at Fort Riley, shipment	Chief of Ordnance.
Delivery of material under manufacture	Bethlehem Steel Co.
6-pounder high-power gun	Do.
Test of 6-inch wire guns, program	Chief of Ordnance.
Horizontal base range finder	Bethlehem Steel Co.
Seven-inch plate for test	Committee of Board.
Deck armor tests, report	Ordnance Board.
Weldon range finder, alteration, report	Field artillery board.
Experimental plotting board	Capt. R. P. Davis.
Incendiary shell	W. S. Randolph.
Covering torpedo boats with mirrors	L. F. Michaele.
Program for test of McClellan 1-pounder gun	Chief of Ordnance.
Submarine boat	Edward Gardner.
Triangle fort	F. Olson.
Dirigible torpedo	S. N. Stewart.
Bullets	H. H. Holmes.
Projectile	C. T. Daniel.
Rotary steam engine	J. E. Hartwell.
Field guns on revolving platform	C. F. Nielsen.
Aerial navigation	Robert Stevenson.
Air ship	S. D. Mott.

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